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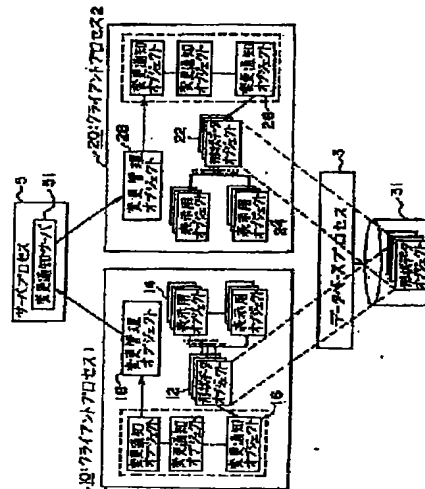
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(54)【発明の名称】 CADシステムにおけるチーム形式による設計方式及びその設計方法

(57)【要約】

【課題】 複数の設計箇所を有する部位に対して同時並行して設計を行うことを可能とし、かつ変更対象となった部位を参照している各設計者にリアルタイムに知らせる。

【解決手段】 クライアントプロセス10は、部品の線や面等の形状データを表す形状データオブジェクト12と、形状データオブジェクト12に依存し線や面等を表す表示画面上のデータを表す表示用オブジェクト14と、形状データオブジェクト12に対して行われた変更内容に関する情報のみを表す変更通知オブジェクト16とを有する。サーバプロセス5の変更通知サーバ51は、部品の設計を行ったクライアントプロセス10から送られてくる変更通知オブジェクト16を、その部品を画面表示しているクライアントプロセス20に分配する。クライアントプロセス20は、変更通知オブジェクト16に基づき、形状データオブジェクト22及び表示用オブジェクト24の更新を行う。



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【特許請求の範囲】

【請求項1】 共有の形状データベースで管理される設計対象に含まれる部品を画面表示する複数のデータ処理手段を有し、複数の設計者が前記各データ処理手段を介してそれぞれに割り当てられた部品の設計をチーム形式で行うCADシステムにおいて、

設計・修正を行った部品に対する設計・修正にのみ関する変更情報を作成し、その変更情報に基づいて前記形状データベースに格納された当該部品のみを更新並びに前記各データ処理手段における当該部品のみを画面表示の更新を行うことを特徴とするCADシステムにおけるチーム形式による設計方法。

【請求項2】 共有の形状データベースで管理される設計対象に含まれる部品を画面表示する複数のデータ処理手段を有し、複数の設計者が前記各データ処理手段を介してそれぞれに割り当てられた部品の設計をチーム形式で行うCADシステムにおいて、

設計者がした設計・修正内容に基づいて前記形状データベースの更新を行う形状データ更新手段と、

設計・修正を行った部品の設計・修正にのみ関する情報を変更情報として作成する変更情報作成手段と、

作成された変更情報を、設計・修正の対象となった部品を画面表示している前記各データ処理手段に対して配送する変更情報通知手段と、

配送された変更情報に基づいて、設計・修正の対象となった部品を表示している前記データ処理手段の表示画面の更新を行う表示画面更新手段と、

を有し、同一の設計対象に含まれる部品の設計・修正を同時並行して行うことを特徴とするCADシステムにおけるチーム形式による設計方式。

【請求項3】 設計・修正の対象となる部品を画面表示して設計者に設計作業を行わせる複数のクライアントと、

前記各クライアントから送られてくる変更情報の配送先を管理するサーバと、

設計対象に含まれる部品の形状データを格納する共有の形状データベースと、

を有し、複数の設計者が前記各クライアントを介してそれぞれに割り当てられた部品の設計をチーム形式で行うCADシステムにおいて、

部品の設計・修正が行われる前記各クライアントは、設計者がした設計・修正内容に基づいて前記形状データベースの更新を行う形状データ更新手段と、

設計・修正を行った部品の設計・修正にのみ関する情報を変更情報として作成する変更情報作成手段と、

変更情報を前記サーバに送信する変更情報送信手段と、

を有し、

前記サーバは、前記クライアントと前記各クライアントが画面表示している部品とを対応させたクライアント参照テーブルを記

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憶する手段と、

送られてきた変更情報に関わる部品を画面表示している前記クライアントを、前記クライアント参照テーブルを参照することで特定し、その特定した前記各クライアントに対して当該変更情報を配送する変更情報通知手段と、

を有し、

設計・修正の対象となった部品を参照している前記クライアントは、

10 受け取った変更情報に基づいて、設計・修正の対象となった部品の表示内容を更新する表示画面更新手段と、を有することを特徴とするCADシステムにおけるチーム形式による設計方式。

【請求項4】 請求項2又は3のいずれかに記載のCADシステムにおけるチーム形式による設計方式において、

前記変更情報作成手段は、設計・修正があったことを通知する通知情報として変更情報を作成し、

前記表示画面更新手段は、受け取った変更情報による通知に従い、前記形状データベースから設計・修正を行った部品の設計・修正内容のみを読み出して部品の表示内容を更新することを特徴とするCADシステムにおけるチーム形式による設計方式。

【請求項5】 請求項2又は3のいずれかに記載のCADシステムにおけるチーム形式による設計方式において、

前記変更情報作成手段は、実際の設計・修正内容のみを変更情報として作成し、

前記表示画面更新手段は、受け取った変更情報に含まれている内容に基づいて設計・修正の対象となった部品の表示内容を更新することを特徴とするCADシステムにおけるチーム形式による設計方式。

【請求項6】 請求項2又は3のいずれかに記載のCADシステムにおけるチーム形式による設計方式において、

前記形状データベースは、オブジェクト指向データベースであり、その他の前記各手段は、オブジェクト指向で実現することを特徴とするCADシステムにおけるチーム形式による設計方式。

40 【請求項7】 請求項2又は3のいずれかに記載のCADシステムにおけるチーム形式による設計方式において、

前記形状データ更新手段は、各部品に対応する形状データの存在が有効かどうかを設定する形状データ状態情報を保持することを特徴とするCADシステムにおけるチーム形式による設計方式。

【請求項8】 設計対象に含まれる部品を画面表示する複数のデータ処理手段を有し、複数の設計者が前記各データ処理手段を介してそれぞれに割り当てられた部品の設計をチーム形式で行うCADシステムにおいて、

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設計者がした設計・修正内容に基づいて、前記データ処理手段共有の形状データベースに格納されている部品の形状データを更新するステップと、
いずれかの前記データ処理手段を介して形状データを更新するステップと、

設計・修正が行われた部品の設計・修正にのみ関連する変更情報を作成するステップと、
作成された変更情報を、設計・修正の対象となった部品を画面表示している前記各データ処理手段に対して配送するステップと、

配送された変更情報に基づいて、設計・修正の対象となった部品を表示している前記データ処理手段の表示画面の更新を行うステップと、

を有し、同一の設計対象に含まれる部品の設計・修正を同時並行して行うことを特徴とするCADシステムにおけるチーム形式による設計方法。

【請求項9】 共有の形状データベースで管理される設計対象に含まれる部品の形状データをメモリ上にロードすることによって前記部品を画面表示する複数のデータ処理手段を有し、複数の設計者が前記各データ処理手段を介してそれぞれに割り当てられた部品の設計をチーム形式で行うCADシステムにおいて、
設計・修正を行った部品の設計・修正内容のみを抽出し変更情報として作成する変更情報作成手段と、
チーム内において作成された変更情報を順次蓄積する変更情報履歴記憶手段と、
前記変更情報履歴記憶手段に蓄積された変更情報への更新権を制御管理する排他制御手段と、
前記排他制御手段により更新権を得た後、設計対象に含まれる部品に関する全ての変更情報を前記変更情報履歴記憶手段から読み出し、その読み出した変更情報に基づいて前記メモリ上の形状データを更新し、また、入力されたコマンドを実行することによって前記メモリ上の形状データ及び前記形状データベースの更新を行う形状データ管理手段と、
前記メモリ上の形状データに基づいて部品の画面表示を行う表示データ管理手段と、
を有することを特徴とするCADシステムにおけるチーム形式による設計方式。

【請求項10】 請求項9記載のCADシステムにおけるチーム形式による設計方式において、
前記各データ処理手段において前記変更情報履歴記憶手段から読み出した変更情報の位置を記録する変更情報反映記録手段を有し、
前記形状データ管理手段は、任意の位置までの変更情報を前記変更情報履歴記憶手段から読み出し前記メモリ上に反映させることを特徴とするCADシステムにおけるチーム形式による設計方式。

【請求項11】 請求項10記載のCADシステムにおけるチーム形式による設計方式において、

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前記形状データ管理手段は、設計対象に含まれる部品に関する変更情報のうち前記メモリ上に反映させていない変更情報のみを前記変更情報履歴記憶手段から読み出して前記メモリ上の形状データの更新を行うことを特徴とするCADシステムにおけるチーム形式による設計方式。

【請求項12】 請求項11記載のCADシステムにおけるチーム形式による設計方式において、

前記形状データ管理手段は、設計対象に含まれる部品に関する変更情報が蓄積される度にその変更情報を前記変更情報履歴記憶手段から逐次読み出して前記メモリ上の形状データの更新を行うことを特徴とするCADシステムにおけるチーム形式による設計方式。

【請求項13】 設計・修正の対象となる部品の形状データをメモリ上にロードすることにより前記部品を画面表示して設計者に設計作業を行わせる複数のクライアントと、

前記各クライアントにおける設計・修正内容を一括管理するサーバと、

10 設計対象に含まれる部品の形状データを格納する共有の形状データベースと、

を有し、複数の設計者が前記各クライアントを介してそれぞれに割り当てられた部品の設計をチーム形式で行うCADシステムにおいて、

前記クライアントは、
設計・修正を行った部品の設計・修正内容のみを抽出し変更情報として作成する変更情報作成手段と、
作成された変更情報を前記サーバに送る変更情報通知手段と、

30 を有し、
前記サーバは、
前記クライアントから送られてくる変更情報を順次蓄積する変更情報履歴記憶手段と、
前記変更情報履歴記憶手段に蓄積された変更情報への更新権を制御管理する排他制御手段と、

を有し、
前記クライアントは、更に、

前記排他制御手段により更新権を得た後、設計対象に含まれる部品に関する全ての変更情報を前記変更情報履歴記憶手段から読み出し、その読み出した変更情報に基づいて前記メモリ上の形状データを更新し、また、入力されたコマンドを実行することによって前記メモリ上の形状データ及び前記形状データベースの更新を行う形状データ管理手段と、

前記メモリ上の形状データに基づいて部品の画面表示を行う表示データ管理手段と、

を有することを特徴とするCADシステムにおけるチーム形式による設計方式。

【発明の詳細な説明】

50 【0001】

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【発明の属する技術分野】本発明はCADシステムにおいて1つの設計対象を複数の部位に分割し、各部位を同時並行して設計を行うチーム形式による設計方式、特に複数の設計者による同一部位に対する設計作業の効率化に関する。

【0002】

【従来の技術】従来、例えば自動車の設計のように設計対象が比較的大型で多数に及ぶ部品から構成されるものを設計する場合、作成した自動車の外観を設計単位となる複数の部位（コンポーネント）に分割し、その後は各部位を同時に並行して設計を行ういわゆるチーム形式のCADシステムが導入されている。このチーム形式によるCADシステムにおいては、複数の設計者がデータ処理用の各端末装置において各部位の設計を同時並行して進めることができるので、設計の効率化や設計期間の短縮を図ることが可能となる。但し、設計者は、隣接する部位との接続部分等他人の設計部分と干渉しあう部分の設計を行うような場合には、その他人の設計による部位の最新形状をリアルタイムに把握する必要がある。そこで、従来においては、例えば特開平5-242174号公報に示されているように、隣接した部位に対して修正がなされた場合にはその修正内容をリアルタイムに表示させることで設計者間でのコミュニケーションの悪化を防止し全体として効率的なチーム形式による設計を可能としている。

【0003】

【発明が解決しようとする課題】しかしながら、上記設計方式は、同時並行して行われた他の部位に対する修正内容を自己の端末装置の表示画面にリアルタイムに反映させることはできたととしても同一部位に対する同時並行して行われる変更を認めるものではない。

【0004】例えば、エンジンルーム、乗員ルーム及びトランクルームから車体を構成するいわゆる3ボックスタイプの自動車の外装を設計する場合であって、車体をエンジンルーム、乗員ルーム及びトランクルームの3つの部位に分割して設計を行う場合を想定すると、通常は部位毎に一人ずつ設計者を割り当てるか、若しくは各部位に含まれる部品毎に設計者を割り当てる。仮に一つの部位の設計を複数の設計者に割り当てたとしたとしてもただ一人の設計者にのみデータの更新権を与えるようにしている。従来の方式においては、1つの部位に複数の設計者を割り当てて同時並行して設計を行わせると、後からディスク等にセーブしたデータによりその前にセーブしたデータを上書きしてしまうからである。例えば、エンジンルームの部位において、サイドターンシグナルランプとフロントバンパーとは相互に干渉し合わない部品であるにもかかわらず従来においては同じ部位に対する設計であるとして同時並行して設計作業を行うことはできない。

【0005】また、サイドプロテクションモールディン

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グ、サイドマッドガード等の設計は、複数の部位にまたがったとしても一つの部品（設計単位）として通常一人の設計者に任されるが、この部品の設計を行うために従来においては、前述した理由により全ての部位に対する更新権を同時に得なければ全体的な設計を行うことができなかった。もちろん、一つの部位毎に更新権を得て順次設計を行うことも可能ではあるが、部位の境界部の不整合を招きやすくなり効率的な設計方法だとはいえない。

10 【0006】このように、設計対象となる一つの部位に複数の設計箇所である部品が含まれ、各部品を複数の設計者に分担している場合でも、従来において一つの部位に割り当てられた各設計者は、同時並行して設計をすることはできなかった。

【0007】本発明は以上のような問題を解決するためになされたものであり、その目的は、複数の設計箇所を有する一つの部位に対しての同時並行して設計を行うことを可能とするとともにその設計により変更した部位を参照している各設計者に対してその変更内容をリアルタイムに知らせることができるCADシステムにおけるチーム形式の設計方式及び設計方法を提供することにある。

20 【0008】

【課題を解決するための手段】以上の目的を達成するために、第1の発明に係るCADシステムにおけるチーム形式による設計方法は、共有の形状データベースで管理される設計対象に含まれる部品を画面表示する複数のデータ処理手段を有し、複数の設計者が前記各データ処理手段を介してそれぞれに割り当てられた部品の設計をチーム形式で行うCADシステムにおいて、設計・修正を行った部品に対する設計・修正にのみ関する変更情報を作成し、その変更情報に基づいて前記形状データベースに格納された当該部品のみを更新並びに前記各データ処理手段における当該部品のみを画面表示の更新を行うことを特徴とする。

30 【0009】第2の発明に係るCADシステムにおけるチーム形式による設計方式は、共有の形状データベースで管理される設計対象に含まれる部品を画面表示する複数のデータ処理手段を有し、複数の設計者が前記各データ処理手段を介してそれぞれに割り当てられた部品の設計をチーム形式で行うCADシステムにおいて、設計者がした設計・修正内容に基づいて前記形状データベースの更新を行う形状データ更新手段と、設計・修正を行った部品の設計・修正にのみ関する情報を変更情報として作成する変更情報作成手段と、作成された変更情報を、設計・修正の対象となった部品を画面表示している前記各データ処理手段に対して配送する変更情報通知手段と、配送された変更情報に基づいて、設計・修正の対象となった部品を表示している前記データ処理手段の表示画面の更新を行う表示画面更新手段とを有し、同一の設

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計対象に含まれる部品の設計・修正を同時並行して行うことを特徴とする。

【0010】第3の発明に係るCADシステムにおけるチーム形式による設計方式は、設計・修正の対象となる部品を画面表示して設計者に設計作業を行わせる複数のクライアントと、前記各クライアントから送られてくる変更情報の配送先を管理するサーバと、設計対象に含まれる部品の形状データを格納する共有の形状データベースとを有し、複数の設計者が前記各クライアントを介してそれぞれに割り当てられた部品の設計をチーム形式で行うCADシステムにおいて、部品の設計・修正が行われる前記各クライアントは、設計者がした設計・修正内容に基づいて前記形状データベースの更新を行う形状データ更新手段と、設計・修正を行った部品の設計・修正にのみ関する情報を変更情報として作成する変更情報作成手段と、変更情報を前記サーバに送信する変更情報送信手段とを有し、前記サーバは、前記クライアントと前記各クライアントが画面表示している部品とを対応させたクライアント参照テーブルを記憶する手段と、送られてきた変更情報に関わる部品を画面表示している前記クライアントを前記クライアント参照テーブルを参照することで特定し、その特定した前記各クライアントに対して当該変更情報を配送する変更情報通知手段とを有し、設計・修正の対象となった部品を参照している前記クライアントは、受け取った変更情報に基づいて、設計・修正の対象となった部品の表示内容を更新する表示画面更新手段とを有することを特徴とする。

【0011】第4の発明は、上記第2又は第3いずれかの発明において、前記変更情報作成手段は、設計・修正があったことを通知する通知情報として変更情報を作成し、前記表示画面更新手段は、受け取った変更情報による通知に従い、前記形状データベースから設計・修正を行った部品の設計・修正内容のみを読み出して部品の表示内容を更新することを特徴とする。

【0012】第5の発明は、上記第2又は第3いずれかの発明において、前記変更情報作成手段は、実際の設計・修正内容のみを変更情報として作成し、前記表示画面更新手段は、受け取った変更情報に含まれている内容に基づいて設計・修正の対象となった部品の表示内容を更新することを特徴とする。

【0013】第6の発明は、上記第2又は第3いずれかの発明において、前記形状データベースは、オブジェクト指向データベースであり、その他の前記各手段は、オブジェクト指向で実現することを特徴とする。

【0014】第7の発明は、上記第2又は第3いずれかの発明において、前記形状データ更新手段は、各部品に対応する形状データの存在が有効かどうかを設定する形状データ状態情報を保持することを特徴とする。この発明によれば、画面上において部品が作成され、それに伴って生成された当該部品に対応する形状データが有効に

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存在しているか、あるいは部品が表示画面から削除されたか（この場合、実際の形状データは削除されず単にその存在が無効となる）、という形状データ状態情報を保持し、形状データ状態情報の内容が無効のときに形状データの変更命令が出されてたとしても受け付けないようにした。これにより、例えば、形状データの削除命令の直後に移動命令が出された場合でもその移動命令を受け付けることはないで、設計内容に矛盾が生じることがない。

【0015】第8の発明に係るCADシステムにおけるチーム形式による設計方法は、設計対象に含まれる部品を画面表示する複数のデータ処理手段を有し、複数の設計者が前記各データ処理手段を介してそれぞれに割り当てられた部品の設計をチーム形式で行うCADシステムにおいて、設計者がした設計・修正内容に基づいて、前記データ処理手段共有の形状データベースに格納されている部品の形状データを更新するステップと、いずれかの前記データ処理手段を介して形状データを更新するステップと、設計・修正が行われた部品の設計・修正にのみ関する変更情報を作成するステップと、作成された変更情報を、設計・修正の対象となった部品を画面表示している前記各データ処理手段に対して配送するステップと、配送された変更情報に基づいて、設計・修正の対象となった部品を表示している前記データ処理手段の表示画面の更新を行うステップとを有し、同一の設計対象に含まれる部品の設計・修正を同時並行して行うことを特徴とする。

【0016】上記発明において、例えば、設計・修正を行ったデータ処理手段若しくはクライアントは、何らかのコマンドを発行して設計・修正を行うものと考えられるが、そのコマンド自身あるいは設計・修正の実行前後の差異に関する内容のみを抽出し、その内容のみを他のデータ処理手段においても実行等させることで反映させれば、同じ画面表示の内容になるはずである。従って、本発明においては、部品に対する設計・修正内容のみを抽出し、その抽出した内容をその部品を表示している各データ処理手段等において実行させることで、その部品を画面表示している全てのデータ処理手段等において同じ表示内容になるようにした。また、上記発明においては、部品に対する設計・修正内容のみに基づいて形状データベースを更新するようにしたので、他の部品の形状データを上書きして消失するようなことはない。すなわち、本発明によれば、同一部位に対して複数の設計者により同時並行して設計・修正を行うことができる。

【0017】また、第9の発明に係るCADシステムにおけるチーム形式による設計方式は、共有の形状データベースで管理される設計対象に含まれる部品の形状データをメモリ上にロードすることによって前記部品を画面表示する複数のデータ処理手段を有し、複数の設計者が前記各データ処理手段を介してそれぞれに割り当てられ

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た部品の設計をチーム形式で行うCADシステムにおいて、設計・修正を行った部品の設計・修正内容のみを抽出し変更情報として作成する変更情報作成手段と、チーム内において作成された変更情報を順次蓄積する変更情報履歴記憶手段と、前記変更情報履歴記憶手段に蓄積された変更情報への更新権を制御管理する排他制御手段と、前記排他制御手段により更新権を得た後、設計対象に含まれる部品に関する全ての更新情報を前記変更情報履歴記憶手段から読み出し、その読み出した変更情報に基づいて前記メモリ上の形状データを更新し、また、入力されたコマンドを実行することによって前記メモリ上の形状データ及び前記形状データベースの更新を行う形状データ管理手段と、前記メモリ上の形状データに基づいて部品の画面表示を行う表示データ管理手段とを有することを特徴とする。

【0018】第10の発明は、第9の発明において、前記各データ処理手段において前記変更情報履歴記憶手段から読み出した変更情報の位置を記録する変更情報反映記録手段を有し、前記形状データ管理手段は、任意の位置までの更新情報を前記変更情報履歴記憶手段から読み出し前記メモリ上に反映させることを特徴とする。

【0019】第11の発明は、第10の発明において、前記形状データ管理手段は、設計対象に含まれる部品に関する更新情報のうち前記メモリ上に反映させていない更新情報のみを前記変更情報履歴記憶手段から読み出して前記メモリ上の形状データの更新を行うことを特徴とする。

【0020】第12の発明は、第11の発明において、前記形状データ管理手段は、設計対象に含まれる部品に関する更新情報が蓄積される度にその更新情報を前記変更情報履歴記憶手段から逐次読み出して前記メモリ上の形状データの更新を行うことを特徴とする。

【0021】更に、第13の発明に係るCADシステムにおけるチーム形式による設計方式は、設計・修正の対象となる部品の形状データをメモリ上にロードすることにより前記部品を画面表示して設計者に設計作業を行わせる複数のクライアントと、前記各クライアントにおける設計・修正内容を一括管理するサーバと、設計対象に含まれる部品の形状データを格納する共有の形状データベースとを有し、複数の設計者が前記各クライアントを介してそれぞれに割り当てられた部品の設計をチーム形式で行うCADシステムにおいて、前記クライアントは、設計・修正を行った部品の設計・修正内容のみを抽出し変更情報として作成する変更情報作成手段と、作成された変更情報を前記サーバに送る変更情報通知手段とを有し、前記サーバは、前記クライアントから送られてくる変更情報を順次蓄積する変更情報履歴記憶手段と、前記変更情報履歴記憶手段に蓄積された変更情報への更新権を制御管理する排他制御手段とを有し、前記クライアントは、更に、前記排他制御手段により更新権を得た

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後、設計対象に含まれる部品に関する全ての更新情報を前記変更情報履歴記憶手段から読み出し、その読み出した変更情報に基づいて前記メモリ上の形状データを更新し、また、入力されたコマンドを実行することによって前記メモリ上の形状データ及び前記形状データベースの更新を行う形状データ管理手段と、前記メモリ上の形状データに基づいて部品の画面表示を行う表示データ管理手段とを有することを特徴とする。

【0022】上記発明によれば、例えば設計・修正を行ったコマンド自身あるいは設計・修正の実行前後の差異に関する内容のみを抽出し作成した変更情報を履歴管理し、その変更情報に基づいて各データ処理手段若しくは各クライアントにおいて画面表示の更新や形状データベースの更新を行うようにしたので、他の設計者がした設計・修正内容を自己の画面表示に反映させることができるとともに、上書きすることなく形状データベースの更新を行うことができる。これにより、同一部位に対して複数の設計者により同時並行して設計・修正を行うことができる。

【0023】

【発明の実施の形態】以下、図面に基づいて、本発明の好適な各実施の形態について説明する。

【0024】実施の形態1. 図1は、本発明に係るCADシステムにおけるチーム形式による設計方式の一実施の形態を示したブロック構成図である。本実施の形態における設計方式は、クライアントプロセス10、20、データベースプロセス3及びサーバプロセス5で構成され、それぞれオブジェクトを含んでいる。

【0025】クライアントプロセス10、20は、設計作業単位すなわちデータ処理手段である端末装置等の表示画面毎に対応させて生成される。クライアントプロセス10に含まれる形状データオブジェクト12は、アプリケーションオブジェクトであり、例えば線や面等の形状データを表す。表示用オブジェクト14は、形状データオブジェクト12に依存するオブジェクトであり、例えば線や面等を表す表示画面上のデータである。各部位は、通常、複数の形状データオブジェクト12によって表現され、複数の表示用オブジェクト14によって表示される。形状データオブジェクト12と表示用オブジェクト14は、画面表示するために必要なオブジェクトであるので、自己の設計対象となる部位のみならず他の者が設計している画面上の部位に対しても生成される。逆にいうと、画面上に部位を表示する際に、その部位に含まれる各部品の形状データオブジェクト12と表示用オブジェクト14は生成される。そして、形状データオブジェクト12と表示用オブジェクト14は、図2に示すような表示データ対応テーブルによって関連付けられ管理される。表示用オブジェクト14は、形状データオブジェクト12に対応して通常一つ生成され、ある形状データを異なる形式、例えば描画や数値表で表現するとき

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などは複数生成される。表示データ対応テーブルへの設定は、部位の画面上への表示、削除に伴い、自動的に行われる。変更通知オブジェクト16は、形状データオブジェクト12に対して行われた変更の内容を表す。変更管理オブジェクト18は、作成された変更通知オブジェクト16を管理し、生成された順に変更通知オブジェクト18をサーバプロセス5に送る。

【0026】一方のクライアントプロセス20に含まれる形状データオブジェクト22及び表示用オブジェクト24は、クライアントプロセス10上の各オブジェクト12、14と同じであり、更新権の有無に関係なく表示される部位に対応して生成される。また、クライアントプロセス20は、図2に示したのと同様の形式の表示データ対応テーブルを保持している。変更管理オブジェクト28は、サーバプロセスから送られてきた変更通知オブジェクト26を管理し、受け取った順に変更対象となる部品の形状データの更新を形状データオブジェクト22にさせ、更に表示用オブジェクト24を更新させる。変更通知オブジェクト26は、変更通知オブジェクト18と同様に形状データオブジェクトに対して行われた変更の内容を表すが、この例の場合は他のクライアントプロセス10によって変更された内容を含んでいる。なお、本実施の形態では、クライアントプロセス10における変更内容をクライアントプロセス20に反映させる例で説明するため、便宜上、各クライアントプロセス10、20にそれぞれ変更、反映に必要な機能のみを持つような説明をしたが、本来はそれぞれ同等の機能を有しており、双方向の変更、反映が可能である。

【0027】データベースプロセス3は、部品形状データオブジェクトを格納する形状データベース31を管理する。形状データベース31は、オブジェクト指向データベースである。部品形状データオブジェクトの管理方式は一般的な形式でよい。

【0028】サーバプロセス5は、各クライアントプロセスにおいて作成された変更通知オブジェクトを所定のクライアントプロセスに分配する変更通知サーバ51を有している。受け取った変更通知オブジェクトをどのクライアントプロセスに分配するかは、図3に示したような部位参照テーブルを参照することによって知ることができる。このサーバプロセス5が持つ部位参照テーブルには、形状データオブジェクトとファイルディスクリプタとを対応づけて設定されている。ファイルディスクリプタは、クライアントプロセスが起動されサーバプロセス5とセッションが確立された時点でクライアントプロセス毎にユニークに割り当てられる。そして、各クライアントプロセスが動作する端末装置上において画面に部位を表示すると、そのとき表示した部位に関連する部品の形状データオブジェクトのIDをサーバプロセス5に通知する。サーバプロセス5は、受け取ったIDとそのIDの送信元となるクライアントプロセスに割り当てた

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ファイルディスクリプタとを対応させて部位参照テーブルに登録する。部位参照テーブルに登録されたデータは、各クライアントプロセスにおいて部品の表示を止めたときに削除される。また、クライアントプロセスとのセッション終了時にそのクライアントプロセスに関連する登録データは全て削除される。この部位参照テーブルへの設定処理は、クライアントプロセスの起動、消滅に応じて自動的に行われる。

【0029】上記各プロセス3、5、10、20は、例えば図4に示すようなCADシステム上に於いて一般的なコンピュータ上で動作する。また、表示データ対応テーブルや部位参照テーブルは、各プロセスが動作するコンピュータのメモリ上に展開される。但し、各クライアントプロセスは、設計作業単位、表示画面単位に生成されるので、それぞれが各設計者に割り当てられた1台の端末装置すなわちデータ処理手段上で動作することが一般的であると思われるが、このような形態に限らず複数の設計者が1台のコンピュータ上で同時にデータ処理を行う場合はそのコンピュータ上に共存することになる。以降の説明においては、1台の端末装置上で1つのクライアントプロセスが動作するものとして説明する。

【0030】本実施の形態において特徴的なことは、以上の構成を設けたことで、何ら不都合を生じることなく1つの部位に対する複数の設計者に同時に更新権を与え、1つの部位に対して同時並行して設計をできるようにしたことである。また、他の設計者により設計・修正内容をリアルタイムに表示させることができるようにしたことである。

【0031】次に、クライアントプロセス10において部品の形状を変更した場合、その変更内容がクライアントプロセス20に送られ反映されるまでの動作について図5に示したフローチャートに基づいて説明する。なお、一つの部品は、通常複数の形状データオブジェクトによって構成されているが、ここでは、一つの形状データオブジェクトで構成されているものとして説明する。

【0032】まず、クライアントプロセス10を動作させる設計者は、CADのコマンドを発行してある部品の形状等を画面上で修正したとすると(ステップ11)、内部では形状データオブジェクト12が変更されることになる(ステップ12)。形状データオブジェクト12が変更されると、更新メソッドにより形状データベース31の内容をリアルタイムに更新しようとする(ステップ13)。データベースプロセス3は、クライアントプロセス10からの更新要求を受け取ると、更新要求を順番に実行し、形状データベース31の内容を逐次更新する(ステップ13)。形状データオブジェクト12は、形状データベース31の更新とともに変更通知オブジェクト16を生成する(ステップ14)。変更通知オブジェクト16は、変更した旨を含み、クライアントプロセス10自身のためのみならず他のクライアントプロセス

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20に通知するための情報となる。変更通知オブジェクト16は、一つのCADコマンドが一つの形状等のみを変更するのであれば通常一つ生成される。生成された変更通知オブジェクト16は、変更管理オブジェクト18が管理するキューに登録される。そして、変更管理オブジェクト18は、表示データ対応テーブルを参照し、更新メソッドを呼び出し対応づけられている表示用オブジェクト14に対し更新の指示を行う。例えば、図2において変更された形状データオブジェクト12のIDが

“A1”だとすると、IDが“B1”、“B2”、“B3”の表示用オブジェクト14に対して更新指示を出すことになる。表示用オブジェクト14は、このとき指示に含まれ引数として渡される変更情報に基づいて形状データにより自分自身を更新する(ステップ15)。自分自身を更新することは、画面上に表示された部位の一部分を形成する部品の形状が有効に更新されたということである。

【0033】以上の一連の動作により、更新権が付与され設計対象である部位の形状等の修正が設計者により有効に行われ、画面は修正後の状態で表示される。

【0034】更に、クライアントプロセス10において変更管理オブジェクト18は、順次変更通知オブジェクト16をキューから取り出し、サーバプロセス5に送信する。本実施の形態においては、各プロセスをソケットを使用して接続しているので、変更通知オブジェクト16を送信する前にテキスト形式への交換を行っている。

【0035】変更通知サーバ51は、変更通知を受け取ると(ステップ21)、変更通知の内容からどの形状データオブジェクトに対する変更であるかを知ることができるので、この変更対象となった形状データオブジェクトに基づいて部位参照テーブルを検索して対応しているファイルディスクリプタを得る。すなわち、変更通知サーバ51は、部位参照テーブルを検索することによって、形状データオブジェクトにより表現されている部位を画面上に表示しているクライアントプロセスを特定することができる(ステップ22)。従って、変更通知サーバ51は、特定したクライアントプロセスに対して受け取った変更通知を配送する(ステップ23)。なお、変更通知の送信元であるクライアントプロセスにおいては、画面上の表示をすでに自ら更新しているので変更通知を配送する必要はない。例えば、変更された形状データオブジェクト12のIDが“A1”だとすると、変更通知サーバ51は、図3に示した部位参照テーブルを参照してファイルディスクリプタが“FD1”、“FD2”であるクライアントプロセスに対して変更通知を配送しようとするが、IDが“A1”である形状データオブジェクト12を変更したクライアントプロセス10のファイルディスクリプタが“FD1”であれば、ファイルディスクリプタが“FD2”であるクライアントプロセスに対して変更通知を配送することになる。

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【0036】変更通知が送られてきたクライアントプロセス20の変更管理オブジェクト28は、その変更通知を変更通知オブジェクト26に変換し復元した後、管理するキューに順次登録する(ステップ31)。変更管理オブジェクト28は、登録された変更通知オブジェクト26を順次取り出し、更新メソッドを呼び出し対応する形状データオブジェクト22並びに表示用オブジェクト24に更新指示を行う。どの形状データオブジェクト22に対して更新指示を出すかは、変更通知オブジェクト26に含まれている通知情報により特定することができる。形状データオブジェクト22は、形状データベース31をアクセスし部品に対する設計・修正内容のみを読み出し、この読み出した変更上に基づいてクライアントプロセス20における当該部品の形状データを更新する(ステップ32)。また、更新対象となる表示用オブジェクト24は、表示データ対応テーブルを参照することによって得ることができる。表示用オブジェクト24

は、通知情報に基づいて既に更新された形状データにより自分自身を更新する(ステップ33)。自分自身を更新することによって、画面上に表示された部位の一部分を形成する部品の形状を有効に更新することができる。

【0037】以上のようにして、クライアントプロセス10によって行われた修正がクライアントプロセス20にもリアルタイムに反映することができる。つまり、クライアントプロセス20において、クライアントプロセス10が設計対象としている部位に対して更新権を得ていないとき、すなわちクライアントプロセス10の設計対象となる部位を参照のみを行っているときには、クライアントプロセス10によって行われた変更内容がクライアントプロセス20における画面上にリアルタイムに反映される。また、クライアントプロセス20がクライアントプロセス10の設計対象と同一部位に更新権を得ているとき、すなわちクライアントプロセス10と同時並行して同じ部位の設計を行っているときには、同じ部位であってもクライアントプロセス10が行った部分のみ変更されるので、クライアントプロセス20が行っている修正作業の内容が上書きされて消失することはない。

【0038】このようにして、本実施の形態においては、同一部位に対して同時並行して設計を行うことができる。

【0039】なお、上記説明では、2つのクライアントプロセスの場合で説明したが、これに限られたものではなく、前述した構成で複数のクライアントプロセスが存在する場合でも適用することが可能である。この場合、各クライアントプロセスにおける変更管理オブジェクトは、サーバプロセス5を介して複数のクライアントプロセスからの変更通知を受け取ることになるが、変更通知には、変更対象となった形状データオブジェクトを特定できる情報すなわち形状データオブジェクトIDが含まれているので、どのクライアントプロセスが送信元とな

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ったとしても問題なく上記と同様の処理を行うことができる。

【0040】また、サーバプロセス5は、前述したように部位参照テーブルの設定内容に基づいて変更通知を配送するので、部品（コンポーネント）毎、設計を行う製品（モデル）毎、あるいは複数のモデル共通でも設けることができる。

【0041】ところで、以上の説明においては、複数の設計者が同一部位に含まれる部品を並行して設計できるということについて述べたが、複数の設計者が同一部品をほぼ同時に変更しようとする場合もあり得る。例えば、クライアントプロセス20において「5番の要素（部品）をX方向に10mm移動させる」というコマンドが入力されている最中に、クライアントプロセス10から「5番の要素を削除」という変更通知が届く可能性がある。このとき、クライアントプロセス20における移動命令を実行しようとする矛盾が生じてしまう。そこで、本実施の形態においては、このような場合を以下のようにして解消することができる。

【0042】まず、形状データオブジェクト12、22は、各形状データの存在が有効かどうかを設定する形状データ状態情報として活性化状態を保持しており、形状データを表す形状データオブジェクト12、22が作成されたときに活性化状態として「オン」を設定する。そして、形状データオブジェクト12、22に対応した部品に対して削除コマンドが発行されたとき、この活性化状態が「オン」であれば「オフ」に切り換える。なお、削除コマンドが有効に実行されても形状データオブジェクト12、22を実際に削除することはない。アンドゥ機能により復活させなければならない場合があるからである。このとき、クライアントプロセス20は、設計者により5番の要素に対する移動コマンドが発行されたとしても、活性化状態がすでに「オフ」になっているので、その移動コマンドをエラーとして受け付けない。このようにして、部品の形状に矛盾を生じることなくシステム全体としての整合性を保つことができる。

【0043】実施の形態2。上記実施の形態1では、設計・修正を行ったクライアントプロセスが作成する変更情報には、変更した旨を通知する情報のみが含まれ、部品を画面表示していた他のクライアントプロセスは、形状データベース31から実際の設計・修正内容を読み出していたが、本実施の形態では、実際の設計・修正内容を変更情報に含ませるようにしたことを特徴としている。

【0044】つまり、本実施の形態における形状データオブジェクト12は、形状データベース31を更新した設計・修正の内容により変更情報を作成する。例えば、「追加、線要素、点（0、0、0）、点（100、100、0）」あるいは「修正、要素1D2、移動、（4、0、0）」などのように実際の変更内容が変更情報に含

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まれることになる。従って、他のクライアントプロセスには、変更通知のみならず実際の変更された内容が配送されることになる。そして、変更情報を受け取ったクライアントプロセス20において、形状データオブジェクト22と表示用オブジェクト24は、この変更情報に基づいて形状データ並びに画面表示の内容を更新することになる。

【0045】ところで、設計・修正を行ったクライアントプロセス10においては、何らかのコマンドを発行して設計・修正を行うものと考えられるので、本実施の形態では、そのコマンド自身あるいは設計・修正の実行前後の差異に関する内容のみを抽出し、その内容のみを変更情報として作成する。そして、他のクライアントプロセスにおいてその変更情報に基づきコマンド等を実行させれば、設計・修正を行ったクライアントプロセスと同じ環境が生成されるはずである。特に、本実施の形態においては、部品に対する設計・修正内容のみを抽出し、その抽出した変更情報に基づいて形状データベースを更新するようにしたので、他の部品の対するデータを上書きするようなことはなくなる。

【0046】実施の形態3。上記実施の形態1では、オブジェクト指向の技術を利用することを前提としているが、本実施の形態では、その技術を使用しなくても実現できるようにした。図6は、本発明に係るCADシステムにおけるチーム形式による設計方式の他の実施の形態を示したブロック構成図である。本実施の形態における設計方式は、設計を行う際に生成されるクライアントプロセス60、70と、設計対象となる部位の形状等の設計・修正内容を一括管理するサーバプロセス80とで構成される。クライアントプロセス60、70は、設計作業単位など表示画面毎に対応させて生成される。但し、本実施の形態では、上記実施の形態1と同様、各データ処理手段である1台のコンピュータ上で各クライアントプロセス60、70が動作するものとして説明する。

【0047】各クライアントプロセス60、70は、同じ処理機能を持つ形状データ変更部61、71と、変更情報通知部62、72と、表示データ管理部63、73とをそれぞれ有している。形状データ変更部61、71は、メモリ上の形状データを変更するとともに、その変更内容すなわち設計・修正を行った部品の設計・修正内容のみを抽出し変更情報として作成する。また、形状データのメモリ上へのロード、あるいは変更情報に基づく形状データベース90の更新などメモリ上の形状データの管理や形状データベース90へのアクセスを行う。変更情報通知部62、72は、形状データ変更部61、71が生成した変更情報をサーバプロセス80にリアルタイムに送信する。表示データ管理部63、73は、メモリ上の形状データに基づき表示データを生成するが、形状データの更新に伴い表示データを更新することで画面表示された部品形状の更新をリアルタイムに行う。

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【0048】サーバプロセス80は、チーム内のクライアントプロセス60、70が生成する変更情報を部位毎に順次履歴情報として蓄積する変更情報記憶部82と、変更情報記憶部82に蓄積された変更情報への更新権を制御管理する変更情報管理部81とを有している。変更情報管理部81は、特にセマフォとして動作することで排他制御を行う。

【0049】本実施の形態においては、このようにセマフォと変更情報を部位毎に履歴管理する手段とを設けたことを特徴としている。図7は、変更情報記憶部82に記憶される変更情報履歴情報をテーブルで示した概念図であるが、変更情報が記憶される度に通し番号、変更情報の送信元となるクライアントプロセスの識別情報及び実際の変更内容とが組にして蓄積される。通し番号は、変更情報を受け取った順番を明確にするために設けられただけなので、日時や他の採番方法等を利用してよい。また、クライアントプロセスの識別情報には、システム全体でユニークなIDが割り振られる。

【0050】次に、クライアントプロセス60において部品の形状を変更した場合を例にして本実施の形態における動作について図8に示したフローチャートを用いて説明する。なお、最初にクライアントプロセス60のみが更新権を持っている場合で説明する。

【0051】クライアントプロセス60を動作させる設計者が部位の設計を開始するとき、その部位に関する形状データが形状データベース90からメモリにロードされ、部位に含まれる部品が画面表示される。設計者が画面上において修正作業を行った後（ステップ41）、修正内容を反映させるためにCADのコマンドが発行されると（ステップ42）、修正対象となった部位に対するセマフォの獲得をしに行く（ステップ43）。セマフォは、変更情報管理部81によって管理され部位毎に設けられている。なお、この説明においては、更新権はクライアントプロセス60だけに付与されているので、ステップ44～47については後述する。

【0052】形状データ変更部61は、セマフォを獲得できると、コマンドの実行、すなわちメモリ上の形状データを更新し、その更新内容に基づいて変更情報を作成する（ステップ48）。この変更情報は、後段の処理で変更情報記憶部82に変更内容として蓄積される。変更内容は、動作させるアプリケーションに依存するが、変更前の形状データとの差分でもよいし、変更を用いたコマンドでもよい。すなわち、後段の処理において他のクライアントプロセスが変更情報を読み取り実行することにより他のクライアントプロセスにおける画面上の表示内容がその送信元と同じになるようにしているので、変更内容は、一定の規則に基づけばよいことになる。また、表示データ管理部63は、形状データが変更されると画面上の表示を更新する（ステップ49）。更新するためには、形状データ変更部61から送られてくる変更

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情報に基づく。このようにして、形状データに変更を行ったクライアントプロセス60において画面上の更新をリアルタイムに行うことができる。次に、形状データ変更部61は、作成した変更情報をサーバプロセス80に送信する（ステップ50）。

【0053】サーバプロセス80における変更情報管理部81は、変更情報を受け取ると、変更がなされた部位を判定し、部位毎に設けられた変更情報記憶部82に振り分けて蓄積する。

【0054】形状データ変更部61は、変更情報の送信後、発行したコマンドに基づき変更された形状データを形状データベース90に登録する（ステップ51）。そして、セマフォを解放する（ステップ52）。

【0055】このようにして、変更を実際に行ったクライアントプロセス60における画面上の表示並びに形状データの更新処理をリアルタイムに行うことができるが、この変更対象となった部位の参照を開始するクライアントプロセスのために、変更情報管理部81は、形状データベース90へ反映させた変更情報記憶部82に履歴されている変更情報の位置（反映開始位置）の情報を保持し、形状データベース90が更新される度に反映開始位置を移動してやる必要がある。

【0056】次に、クライアントプロセス80においてなされた変更内容を変更された部品を含む部位を参照している他のクライアントプロセス70に反映させる動作について説明する。

【0057】クライアントプロセス70の表示データ管理部73は、変更情報記憶部82の内容を常時監視しており、クライアントプロセス70において画面表示している部位に対する変更情報が変更情報記憶部82に登録されると、当該変更情報を読み出す。表示データ管理部73は、この変更情報を反映することで変更情報の作成元であるクライアントプロセス60と変更対象となった部品の形状については同じ内容となる。詳細に説明すると、クライアントプロセス70は、形状データベース90から参照部位に関する形状データを読み出しメモリにロードして画面表示しているが、このメモリ上の形状データに対して変更情報に基づいて更新を行うことにより変更対象となった部品に対してはクライアントプロセス80におけるメモリの内容と同じになるはずである。このようにして、他のクライアントプロセスにおいて行われた変更内容を反映させることで同じ部品形状をリアルタイムに表示することができる。

【0058】ところで、チーム形式により複数の設計者が並行して設計を行っている場合は、通常、上記の通り変更情報記憶部82の内容を常時監視し変更内容をリアルタイムに反映させることが望ましいが、本実施の形態における設計方式においては、各クライアントプロセスにおいて定期的あるいは同期を取ることを目的としたブロードキャストメッセージの受信時あるいは任意のタ

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タイミングで変更内容を反映させることができる。例えば、変更情報管理部81に一括して図8に示すような変更情報反映記録テーブルを部位毎に設定しておく。このテーブルには、各クライアントプロセスにおいて他のクライアントプロセスが行った設計・修正内容をメモリ上に反映させたところまでの変更情報の通し番号を記録しておく。すなわち、変更情報反映記録テーブルには、各クライアントプロセスにおいて画面表示の更新のために変更情報記憶部82から読み出した変更情報の位置が記録されている。例えば、図9によると、IDが1であるクライアントプロセスは、5番目までの変更情報を反映させて画面上の表示を更新しているので、もし、最新の状態で画面表示をしたければ、変更情報記憶部82からまだ画面表示に反映させていない6番目以降の変更情報を全て読み出し順次実行すればよいことになる。なお、変更情報管理部81において各クライアントプロセスが読み出した変更情報の位置（反映位置）を一括管理させずに、各クライアントプロセスにおいて各自の反映位置を管理させるようにしても実現可能である。

【0059】このように、各クライアントプロセスにおいて任意のタイミングで変更内容を画面上に反映させることができる。そして、全てのクライアントプロセスが常に最新の変更情報を読み出しメモリ上に反映させるようにしていれば、全てのクライアントプロセスにおける画面には、最新の部品形状が表示可能になるはずである。なお、変更情報反映記録テーブルを用いることにより、各クライアントプロセスにおいては、通し番号を指定できるようにすれば、任意の位置の変更情報までを画面表示に反映させることも可能である。

【0060】次に、複数の設計者が更新権を得ている場合の動作について、クライアントプロセス60、70が同一部位の更新権を同時に得ている場合のクライアントプロセス60の動作を例にして説明する。

【0061】クライアントプロセス60は、前述したようにコマンドが発行されると、セマフォを獲得する（ステップ41～43）。ところで、複数人により更新処理が行われている場合（ステップ44）、他のクライアントプロセス70が作成した変更情報は、変更情報記憶部82に登録されているはずである。また、図9に示したように各クライアントプロセスは、自己が更新している部位においてどの変更情報まで画面上に反映させたかを知ることができる。従って、クライアントプロセス60は、反映していない部分の変更情報を変更情報記憶部82から全て読み出し実行することで、メモリ上の形状データに反映させて最新の状態にすることができる（ステップ45）。このとき、表示データ管理部63は、形状データの更新に伴い表示データの更新を行うので、最新の部品形状を画面表示することができる。そして、形状データ変更部61は、発行されたコマンドが実際に実行可能かどうかの整合性のチェックを行う（ステップ4

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6）。これは、設計者が部品を画面表示させコマンドを入力している間に他の設計者がコマンドを実行し同一部品に対して変更する場合がありますからであり、この場合は、後に実行させるコマンドが正常に実行できない可能性があるからである。例えば、5番の要素（部品）をX方向に10mm移動させるコマンドの入力中に、他の設計者が5番の要素を削除するというコマンドを実行した場合などがこれに該当する。このような場合、形状データ変更部61は、整合性がとれず矛盾を検出したとして変更内容を反映せずにセマフォを解放する（ステップ47、52）。なお、コマンドを入力した設計者には、エラーステータスが返され、入力コマンドはキャンセルされたことになる。

【0062】一方、整合性のチェックの結果、整合性が取れていれば、前述したようにコマンドが実際に実行され、メモリ上の形状データ、画面表示内容、形状データベース90の内容がそれぞれ更新され、セマフォが解放される（ステップ48～52）。

【0063】このように、クライアントプロセス60は、自己の変更内容のみならず変更情報記憶部82から読み出した他のクライアントプロセス70による変更内容をメモリ上の形状データに反映させてから形状データベース90に登録するようにしたので、他の設計者による設計・修正内容を上書きして消失することなく同じ部品に対する設計等を同時並行して行うことができる。なお、更新権を獲得していない他の部位を画面表示させていた場合は、メモリ上の形状データのみの更新が可能なのであって形状データベース90の更新はできないこととは言うまでもない。

【0064】なお、形状データ変更部61は、上記処理のように、コマンドを実行する度に更新した部分のみ形状データベース90を更新しているが、データベースとしてシーケンシャルファイルを使用している場合等、データの部分的な更新ができないような場合は、コマンドの実行の度に形状データベース90の更新を行うのではなく、セッションを終了する直前に、まとめてメモリ上のデータで丸ごと書き換えるようにしてもよい。なお、この場合でも変更情報記憶部82の中の反映開始位置を移動してやる必要がある。

【0065】また、他の設計者がすでにチーム設計を開始していた場合、各クライアントプロセスは、形状データベース90から形状データを読み出すとともに変更情報記憶部82から変更情報を読み出し実行することで、最新の状態で画面表示をすることができる。

【0066】また、変更情報記憶部82に登録されている変更情報は、形状データベース90に反映されかつ動作中の全てのクライアントプロセスがメモリに反映させた後に削除することができる。

【図面の簡単な説明】

【図1】 本発明に係るCADシステムにおけるチーム

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形式による設計方式の第1の実施の形態を示したブロック構成図である。

【図2】 第1の実施の形態において使用する表示データ対応テーブルを示した図である。

【図3】 第1の実施の形態において使用する部位参照テーブルを示した図である。

【図4】 第1の実施の形態における設計方式が動作するCADシステムの構成例を示した図である。

【図5】 第1の実施の形態における動作を示したフローチャートである。

【図6】 本発明に係るCADシステムにおけるチーム形式による設計方式の第3の実施の形態を示したブロック構成図である。

【図7】 第3の実施の形態における変更情報記憶部に記憶される変更情報履歴情報の構成例を示した図であ

*る。

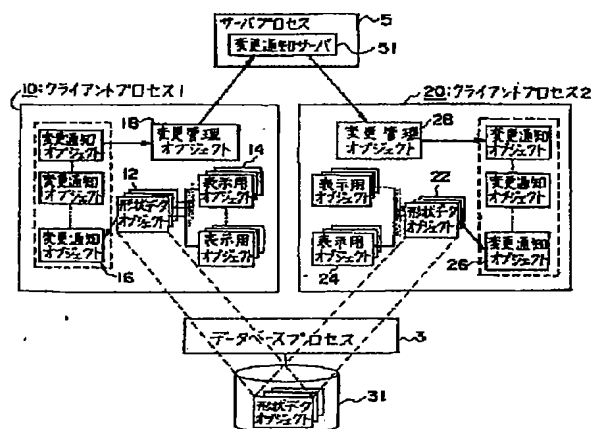
【図8】 第3の実施の形態における動作を示したフローチャートである。

【図9】 第3の実施の形態における変更情報管理部が有する変更情報反映記録テーブルを示した図である。

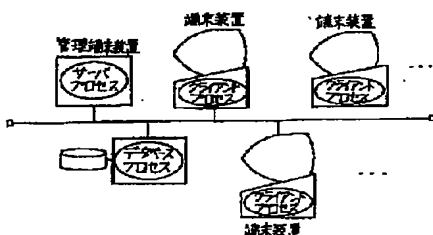
【符号の説明】

3 データベースプロセス、5、80 サーバプロセス、10、20、60、70 クライアントプロセス、12、22 形状データオブジェクト、14、24 表示用オブジェクト、16、26 変更通知オブジェクト、18、28 変更管理オブジェクト、31、90 形状データベース、51 変更通知サーバ、81、71 形状データ変更部、62、72 変更情報通知部、63、73 表示データ管理部、81 変更情報管理部、82 変更情報記憶部。

【図1】



【図4】



【図2】

表示データ対応テーブル	
形状データ オブジェクトID	表示用 オブジェクトID
A1	B1
A1	B2
A1	B3
A2	B4
A2	B5
A3	B6
A4	B7
A4	B8
...	...

【図3】

部位参照テーブル	
形状データ オブジェクトID	ファイル パス名
A1	FD1
A1	FD2
A2	FD1
A3	FD2
A3	FD3
A4	FD4
A4	FD5
...	...

【図9】

変更情報反映記録テーブル	
クライアント プロセスID	NO.
1	5
2	8
...	...
...	...

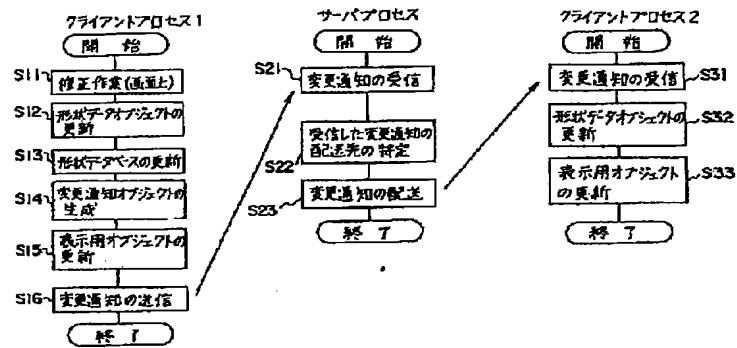
【図7】

変更情報履歴情報		
NO.	クライアント プロセスID	変更内容
1	1	A
2	1	B
3	2	C
4	1	D
5	2	E
...

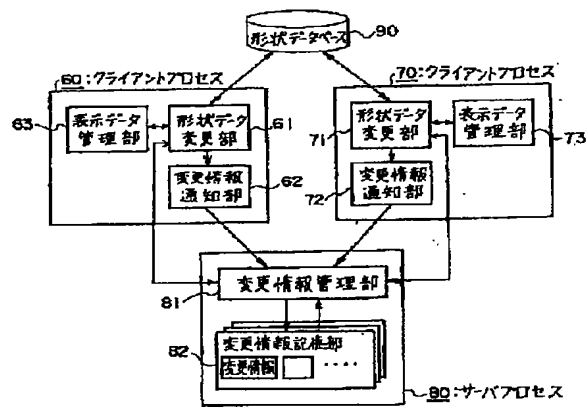
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【図5】



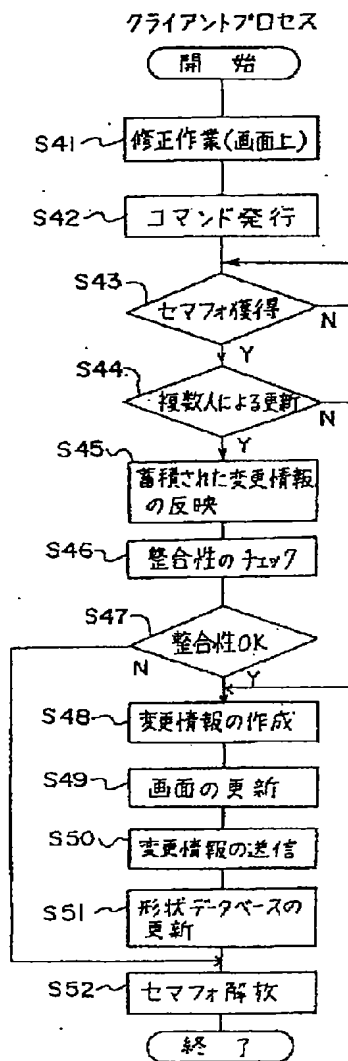
【図6】



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【図8】



PATENT ABSTRACTS OF JAPAN

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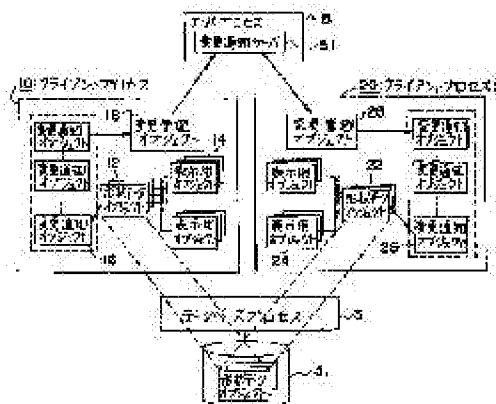
(54) SYSTEM AND METHOD FOR DESIGNING BY TEAM STYLE FOR CAD SYSTEM

(57)Abstract:

PROBLEM TO BE SOLVED: To simultaneously and parallelly design a section having plural designing positions and to report the section of a change object to respective designers referring to the design in real time.

SOLUTION: A client process 10 has a shape data object 12 expressing shape data such as the lines or faces of parts, object 14 for display expressing data on a display screen expressing the lines or faces while depending on the shape data object 12, and change report object 16 expressing only information concerning the contents of a change executed to the shape data object 12. A change report server 51 of a server process 5 distributes the change report object 16 sent from the client process 10, which designs the parts, to client processes 20

displaying these parts on their screens. Based on the change report object 16, the client process 20 updates a shape data object 22 and an object 24 for display.



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application converted registration]

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[Date of registration]

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decision of rejection]

[Date of requesting appeal against examiner's
decision of rejection]

[Date of extinction of right]

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CLAIMS

[Claim(s)]

[Claim 1] It has two or more data-processing means which carry out a screen display of the components contained in the object for a design managed in a shared configuration database. In the CAD system to which two or more architects design the components assigned to each through said each data-processing means in a team format The modification information which carries out Seki only to the design and correction to the components which made a design and correction is created. The design approach by the team format in the CAD system characterized by updating the screen display of only the components concerned in said each data-processing means in the updating list of only the components concerned stored in said configuration database based on the modification information.

[Claim 2] It has two or more data-processing means which carry out a screen display of the components contained in the object for a design managed in a shared configuration database. In the CAD system to which two or more architects design the components assigned to each through said each data-processing means in a team format The renewal means of configuration data which updates said configuration database based on the content of a design / correction which the architect did, A modification information creation means to create the information which carries out Seki only to a design and correction of the components which made a design and correction as modification information, An advice means of modification information to deliver the components set as the object of a design and correction in the created modification information to said each data-processing means which is carrying out a screen display, The renewal means of the display screen which updates the display screen of said data-processing means to display the components set as the object of a design and correction based on the delivered modification information, The design method by the team format in the CAD system characterized by ****(ing) and carrying out by carrying out the concurrency of a design and the correction of the components contained in the same object for a design.

[Claim 3] Two or more clients which a screen display of the components set as the object of a design and correction is carried out [clients], and make a design give an architect, The server which manages the address for delivery of the modification information sent from said each client, In the CAD system to which it has the shared configuration database which stores the configuration data of the components contained in the object for a design, and two or more architects design the components assigned to each through said each client in a team format Said each client on which a design and correction of components are made The renewal means of configuration data which updates said configuration database based on the content of a design / correction which the architect did, A modification information creation means to create the information which carries out Seki only to a design and correction of the components which made a design and correction as modification information, It has a modification information transmitting means to transmit modification information to said server. Said server A means to memorize the client reference table to which the components in which said client and said each client are carrying out a screen display were made equivalent, An advice means of modification information to specify said client which is carrying out a screen display of the components in connection with the sent modification information by referring to said client reference table, and to

deliver the modification information concerned to said each of that specified client, Said client which is referring to the components which ****(ed) and were set as the object of a design and correction is a design method by the team format in the CAD system characterized by having a renewal means of a display screen to update the content of a display of the components set as the object of a design and correction, based on the received modification information.

[Claim 4] In the design method by claim 2 or the team format in a CAD system given in either of 3 said modification information creation means Modification information is created as advice information which notifies that there were a design and correction. Said renewal means of the display screen The design method by the team format in the CAD system characterized by reading only the content of a design / correction of the components which made a design and correction from said configuration database according to the advice using the received modification information, and updating the content of a display of components.

[Claim 5] It is a design method by the team format in the CAD system which said modification information creation means creates only the actual content of a design / correction as modification information in the design method by claim 2 or the team format in a CAD system given in either of 3 , and is characterize by for said renewal means of the display screen to update the content of the components set as the object of a design and correction based on the content include in the received modification information of a display .

[Claim 6] It is a design method by the team format in the CAD system characterized by for said configuration database being an object oriented database, and realizing said each other means by object-oriented in the design method by claim 2 or the team format in a CAD system given in either of 3.

[Claim 7] It is a design method by the team format in the CAD system characterized by holding the configuration data status information which sets up whether said renewal means of configuration data has effective existence of the configuration data corresponding to each part article in the design method by claim 2 or the team format in a CAD system given in either of 3.

[Claim 8] In the CAD system to which it has two or more data-processing means which carry out a screen display of the components contained in the object for a design, and two or more architects design the components assigned to each through said each data-processing means in a team format The step which updates the configuration data of the components stored in the configuration database data-processing means shared [said] based on the content of a design / correction which the architect did, The step which updates configuration data through said one of data-processing means, The step which creates the modification information which carries out Seki only to a design and correction of the components with which a design and correction were made, The step which delivers the components set as the object of a design and correction in the created modification information to said each data-processing means which is carrying out a screen display, The step which updates the display screen of said data-processing means to display the components set as the object of a design and correction based on the delivered modification information, The design approach by the team format in the CAD system characterized by ****(ing) and carrying out by carrying out the concurrency of a design and the correction of the components contained in the same object for a design.

[Claim 9] It has two or more data-processing means which carry out a screen display of said component by loading on memory the configuration data of the components contained in the object for a design managed in a shared configuration database. In the CAD system to which two or more architects design the components assigned to each through said each data-processing means in a team format A modification information creation means to extract only the content of a design / correction of the components which made a design and correction, and to create as modification information, The modification information hysteresis storage means which carries out sequential are recording of the modification information created in the team, The exclusive control means which carries out control management of the update rights to the modification information accumulated in said modification information hysteresis storage means, After acquiring update rights with said exclusive control means, all the modification information about the components contained in the object for a design is read from said modification information hysteresis storage means. A configuration data control means to update

the configuration data on said memory based on the read modification information, and to perform renewal of the configuration data on said memory, and said configuration database by executing the inputted command, The design method by the team format in the CAD system characterized by having the indicative-data management tool which performs the screen display of components based on the configuration data on said memory.

[Claim 10] It is a design method by the team format in the CAD system which characterizes by to have a modification information reflection record means record the location of the modification information which read from said modification information hysteresis storage means in each of said data-processing means in the design method by the team format in a CAD system according to claim 9, and for said configuration data-control means to read the modification information to the location of arbitration from said modification information hysteresis storage means, and to make it reflect on said memory.

[Claim 11] the design method by the team format in the CAD system characterize by for said configuration data control means to carry out the reading appearance only of the modification information which be make to reflect on said memory among the modification information about the components contain in the object for a design from said modification information hysteresis storage means , and to update the configuration data on said memory in the design method by the team format in a CAD system according to claim 10

[Claim 12] the design method by the team format in the CAD system characterized by for said configuration data control means to carry out reading appearance of the modification information serially from said modification information hysteresis storage means whenever the modification information about the components contained in the object for a design be accumulated , and to update the configuration data on said memory in the design method by the team format in a CAD system according to claim 11 .

[Claim 13] Two or more clients which a screen display of said component is carried out [clients], and make a design give an architect by loading on memory the configuration data of the components set as the object of a design and correction, The server which carries out package management of the content of a design / correction in said each client, In the CAD system to which it has the shared configuration database which stores the configuration data of the components contained in the object for a design, and two or more architects design the components assigned to each through said each client in a team format A modification information creation means for said client to extract only the content of a design / correction of the components which made a design and correction, and to create as modification information, It has an advice means of modification information to send the created modification information to said server. Said server The modification information hysteresis storage means which carries out sequential are recording of the modification information sent from said client, It has the exclusive control means which carries out control management of the update rights to the modification information accumulated in said modification information hysteresis storage means. Said client Furthermore, after acquiring update rights with said exclusive control means, all the modification information about the components contained in the object for a design is read from said modification information hysteresis storage means. A configuration data control means to update the configuration data on said memory based on the read modification information, and to perform renewal of the configuration data on said memory, and said configuration database by executing the inputted command, The design method by the team format in the CAD system characterized by having the indicative-data management tool which performs the screen display of components based on the configuration data on said memory.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the block block diagram having shown the gestalt of operation of the 1st of the design method by the team format in the CAD system concerning this invention.

[Drawing 2] It is drawing having shown the table corresponding to the indicative data used in the gestalt of the 1st operation.

[Drawing 3] It is drawing having shown the part reference table used in the gestalt of the 1st operation.

[Drawing 4] It is drawing having shown the example of the CAD structure of a system for which the design method in the gestalt of the 1st operation operates.

[Drawing 5] It is the flow chart which showed the actuation in the gestalt of the 1st operation.

[Drawing 6] It is the block block diagram having shown the gestalt of operation of the 3rd of the design method by the team format in the CAD system concerning this invention.

[Drawing 7] It is drawing having shown the example of a configuration of the modification information hysteresis information memorized by the modification information storage section in the gestalt of the 3rd operation.

[Drawing 8] It is the flow chart which showed the actuation in the gestalt of the 3rd operation.

[Drawing 9] It is drawing having shown the modification information reflection record table which the modification Research and Data Processing Department in the gestalt of the 3rd operation has.

[Description of Notations]

3 5 Database Process, 80 Server Process, 10, 20, 60, 70 Client Process, 12 22 14 A configuration data object, 24 The object for a display, 16 26 18 A change-notice object, 28 Change-management object, 31 90 A configuration database, 51 61 A change-notice server, 71 62 The configuration data modification section, 72 63 The advice section of modification information, 73 The indicative-data Management Department, 81 The modification Research and Data Processing Department, 82 Modification information storage section.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention divides one object for a design into two or more parts in a CAD system, and relates to the increase in efficiency of a design to the same part by the design method by the team format of designing by carrying out the concurrency only of each part, especially two or more architects.

[0002]

[Description of the Prior Art] The CAD system of the so-called team format which divides the appearance of the created automobile into two or more parts (component) used as a design unit, and designs at least each part in parallel simultaneously after that like the design of the former, for example, an automobile, when designing what consists of components which the object for a design is comparatively large-sized, and attain to a large number is introduced. In the CAD system by this team format, since two or more architects can do the concurrency of the design like each part and can advance it in each terminal unit for data processing, it becomes possible to aim at increase in efficiency of a design, and compaction of a design period. However, an architect needs to grasp the newest configuration of the part by the others' design on real time, when designing the part which interferes with others' design parts, such as a part for a connection with an adjoining part, and suits. Then, in the former, when correction is made to the adjoining part as shown, for example in JP,5-242174,A, aggravation of communication between architects is prevented by displaying the content of correction on real time, and the design by the team format efficient as a whole is enabled.

[0003]

[Problem(s) to be Solved by the Invention] However, even if the above-mentioned design method is able to make real time reflect in the display screen of a self terminal unit the content of correction over other parts performed by carrying out a concurrency, it does not accept modification to the same part made by carrying out a concurrency.

[0004] For example, it is the case where sheathing of the so-called 3 box type which constitutes an engine room, a crew room, and a trunk room empty vehicle object of automobile is designed, and if the case where it designs by dividing a car body into three parts, an engine room, a crew room, and a trunk room, is assumed, an architect will be assigned for every components which usually assign one architect at a time for every part, or are contained at least in each part. Even if it assigns two or more architects the design of one part, he is trying to grant only one architect the update rights of data. In the conventional method, it is because the data saved before that with the data saved to the disk etc. afterwards will be overwritten if it is made to design by assigned and carrying out the concurrency of two or more architects to one part. For example, in the part of an engine room, a concurrency cannot be carried out and a design cannot be performed under the condition that it is the design to the same part in the former, although a side turn signal lamp and front bumpers are components which do not interfere each other mutually.

[0005] Moreover, even if it straddled two or more parts, one architect was usually left as one component

(design unit), but if the design of side protection molding, a side mud guard, etc. did not acquire the update rights to all parts simultaneously for the reason mentioned above in the former in order to design this component, it was not able to perform an overall design. Of course, although it is also possible to acquire update rights for every part and to perform a sequential design, it becomes easy to cause the mismatching of the boundary section of a part, and it cannot be said that it is the efficient design approach.

[0006] Thus, even when the components which are two or more design parts were contained to one part used as the object for a design and each part article was shared with two or more architects, each architect assigned to one part in the former was not able to design by carrying out a concurrency.

[0007] It is made in order that this invention may solve the above problems, and the object is to offer the design method and the design approach of a team format in the CAD system which can tell real time about the content of modification to each architect who is referring to the part changed by the design while making possible the thing which receive one part which has two or more design parts and design by carrying out a concurrency.

[0008]

[Means for Solving the Problem] In order to attain the above object, the design approach by the team format in the CAD system concerning the 1st invention It has two or more data-processing means which carry out a screen display of the components contained in the object for a design managed in a shared configuration database. In the CAD system to which two or more architects design the components assigned to each through said each data-processing means in a team format The modification information which carries out Seki only to the design and correction to the components which made a design and correction is created, and it is characterized by updating the screen display of only the components concerned in said each data-processing means in the updating list of only the components concerned stored in said configuration database based on the modification information.

[0009] The design method by the team format in the CAD system concerning the 2nd invention It has two or more data-processing means which carry out a screen display of the components contained in the object for a design managed in a shared configuration database. In the CAD system to which two or more architects design the components assigned to each through said each data-processing means in a team format The renewal means of configuration data which updates said configuration database based on the content of a design / correction which the architect did, A modification information creation means to create the information which carries out Seki only to a design and correction of the components which made a design and correction as modification information, An advice means of modification information to deliver the components set as the object of a design and correction in the created modification information to said each data-processing means which is carrying out a screen display, It is characterized by having the renewal means of the display screen which updates the display screen of said data-processing means to display the components set as the object of a design and correction based on the delivered modification information, and carrying out by carrying out the concurrency of a design and the correction of the components contained in the same object for a design.

[0010] The design method by the team format in the CAD system concerning the 3rd invention Two or more clients which a screen display of the components set as the object of a design and correction is carried out [clients], and make a design give an architect, The server which manages the address for delivery of the modification information sent from said each client, In the CAD system to which it has the shared configuration database which stores the configuration data of the components contained in the object for a design, and two or more architects design the components assigned to each through said each client in a team format Said each client on which a design and correction of components are made The renewal means of configuration data which updates said configuration database based on the content of a design / correction which the architect did, A modification information creation means to create the information which carries out Seki only to a design and correction of the components which made a design and correction as modification information, It has a modification information transmitting means to transmit modification information to said server. Said server A means to memorize the client reference table to which the components in which said client and said each client are carrying out a

screen display were made equivalent, Said client which is carrying out a screen display of the components in connection with the sent modification information is specified by referring to said client reference table. Said client which is referring to the components which have an advice means of modification information to deliver the modification information concerned to said each of that specified client, and were set as the object of a design and correction It is characterized by having a renewal means of the display screen to update the content of a display of the components set as the object of a design and correction, based on the received modification information.

[0011] The 4th invention is set to invention of the 2nd or 3rd either of the above. Said modification information creation means Modification information is created as advice information which notifies that there were a design and correction. Said renewal means of the display screen It is characterized by reading only the content of a design / correction of the components which made a design and correction from said configuration database according to the advice using the received modification information, and updating the content of a display of components.

[0012] The 5th invention creates only the content of a design / correction with said actual modification information creation means as modification information in invention of the 2nd or 3rd either of the above, and it carries out that said renewal means of the display screen updates the content of a display of the components set as the object of a design and correction based on the content included in the received modification information as the description.

[0013] In invention of the 2nd or 3rd either of the above, said configuration database of the 6th invention is an object oriented database, and said each other means are characterized by realizing by object-oriented.

[0014] 7th invention is characterized by holding the configuration data status information which sets up whether said renewal means of configuration data has effective existence of the configuration data corresponding to each part article in invention of the 2nd or 3rd either of the above. [whether according to this invention, the configuration data corresponding to the components concerned which components were created on the screen and generated in connection with it exist effectively, and] Or components were deleted from the display screen, or (in this case, actual configuration data are not deleted but it only becomes invalid that existing them) The configuration data status information to say was held, and it was made not to receive, though the variation order of configuration data was issued when the content of configuration data status information was an invalid. Since the migration instruction is not received by this even when a migration instruction is issued immediately after the deletion instruction of for example, configuration data, conflict does not arise by the content of a design.

[0015] The design approach by the team format in the CAD system concerning the 8th invention In the CAD system to which it has two or more data-processing means which carry out a screen display of the components contained in the object for a design, and two or more architects design the components assigned to each through said each data-processing means in a team format The step which updates the configuration data of the components stored in the configuration database data-processing means shared [said] based on the content of a design / correction which the architect did, The step which updates configuration data through said one of data-processing means, The step which creates the modification information which carries out Seki only to a design and correction of the components with which a design and correction were made, The step which delivers the components set as the object of a design and correction in the created modification information to said each data-processing means which is carrying out a screen display, It is characterized by having the step which updates the display screen of said data-processing means to display the components set as the object of a design and correction based on the delivered modification information, and carrying out by carrying out the concurrency of a design and the correction of the components contained in the same object for a design.

[0016] In the above-mentioned invention, although it is thought that the data-processing means or client which made a design and correction publishes a certain command, and makes a design and correction, only the command itself or the content about the difference before and behind activation of a design and correction is extracted, and if you make it reflected because activation etc. carries out only the content also in other data-processing means, it should become the content of the same screen display. Therefore,

only the content of a design / correction over components is extracted, and it was made to become the same content of a display in this invention in all the data-processing means that are carrying out a screen display of the component by performing the extracted content in each data-processing means to display the component etc. It seems that moreover, the configuration data of other components are overwritten and it does not disappear in the above-mentioned invention since the configuration database was updated only based on the content of a design / correction over components. That is, according to this invention, a concurrency can be carried out by two or more architects to the same part, and a design and correction can be made.

[0017] Moreover, the design method by the team format in the CAD system concerning the 9th invention It has two or more data-processing means which carry out a screen display of said component by loading on memory the configuration data of the components contained in the object for a design managed in a shared configuration database. In the CAD system to which two or more architects design the components assigned to each through said each data-processing means in a team format A modification information creation means to extract only the content of a design / correction of the components which made a design and correction, and to create as modification information, The modification information hysteresis storage means which carries out sequential are recording of the modification information created in the team, The exclusive control means which carries out control management of the update rights to the modification information accumulated in said modification information hysteresis storage means, After acquiring update rights with said exclusive control means, all the modification information about the components contained in the object for a design is read from said modification information hysteresis storage means. A configuration data control means to update the configuration data on said memory based on the read modification information, and to perform renewal of the configuration data on said memory, and said configuration database by executing the inputted command, It is characterized by having the indicative-data management tool which performs the screen display of components based on the configuration data on said memory.

[0018] It is characterized by for the 10th invention to have a modification information reflection record means record the location of the modification information read from said modification information hysteresis storage means in each of said data-processing means in the 9th invention, and for said configuration data-control means to read the modification information to the location of arbitration from said modification information hysteresis storage means, and to make it reflected on said memory.

[0019] 11th invention is characterized by for said configuration data control means reading only the modification information which is not made to reflect on said memory among the modification information about the components contained in the object for a design from said modification information hysteresis storage means, and updating the configuration data on said memory in the 10th invention.

[0020] 12th invention is characterized by for said configuration data control means carrying out reading appearance of the modification information serially from said modification information hysteresis storage means, whenever the modification information about the components contained in the object for a design is accumulated, and updating the configuration data on said memory in the 11th invention.

[0021] Furthermore, the design method by the team format in the CAD system concerning the 13th invention Two or more clients which a screen display of said component is carried out [clients], and make a design give an architect by loading on memory the configuration data of the components set as the object of a design and correction, The server which carries out package management of the content of a design / correction in said each client, In the CAD system to which it has the shared configuration database which stores the configuration data of the components contained in the object for a design, and two or more architects design the components assigned to each through said each client in a team format A modification information creation means for said client to extract only the content of a design / correction of the components which made a design and correction, and to create as modification information, It has an advice means of modification information to send the created modification information to said server. Said server The modification information hysteresis storage means which carries out sequential are recording of the modification information sent from said client, It has the

exclusive control means which carries out control management of the update rights to the modification information accumulated in said modification information hysteresis storage means. Said client Furthermore, after acquiring update rights with said exclusive control means, all the modification information about the components contained in the object for a design is read from said modification information hysteresis storage means. A configuration data control means to update the configuration data on said memory based on the read modification information, and to perform renewal of the configuration data on said memory, and said configuration database by executing the inputted command. It is characterized by having the indicative-data management tool which performs the screen display of components based on the configuration data on said memory.

[0022] According to the above-mentioned invention, hysteresis management of the modification information which extracted and created only the command itself which made a design and correction, for example, or the content about the difference before and behind activation of a design and correction is carried out. Since it was made to perform renewal of a screen display, and renewal of a configuration database in each data-processing means or each client based on the modification information While being able to make the content of a design / correction which other architects did reflect in a self screen display, a configuration database can be updated without overwriting. Thereby, a concurrency can be carried out by two or more architects to the same part, and a design and correction can be made.

[0023]

[Embodiment of the Invention] Hereafter, based on a drawing, the gestalt of each suitable operation of this invention is explained.

[0024] Gestalt 1. drawing 1 of operation is the block diagram having shown the gestalt of 1 operation of the design method by the team format in the CAD system concerning this invention. The design method in the gestalt of this operation consists of client processes 10 and 20, a database process 3, and a server process 5, and contains the object, respectively.

[0025] The client processes 10 and 20 are made to correspond for every display screens, such as a terminal unit which is a design work unit, i.e., a data-processing means, and are generated. The configuration data object 12 contained in the client process 10 is an application object, for example, expresses configuration data, such as a line and a field. The object 14 for a display is an object depending on the configuration data object 12, for example, is data on the display screen showing a line, a field, etc. About each part, it is expressed by two or more configuration data objects 12, and is usually displayed by two or more objects 14 for a display. Since it is an object required in order to carry out a screen display, the configuration data object 12 and the object 14 for a display are generated also to the part on the screen which not only the part set as the design object of self but other persons are designing. Conversely, if it says, in case a part will be displayed on a screen, the configuration data object 12 and the object 14 for a display of each part article which are contained to the part are generated. And the configuration data object 12 and the object 14 for a display are associated and managed on the table corresponding to an indicative data as shown in drawing 2 . One object 14 for a display is usually generated corresponding to the configuration data object 12, and when a different format, for example, drawing and a numerical table, expresses a certain configuration data, two or more generation of it is carried out. Setting out on the table corresponding to an indicative data is automatically performed with the display of a up to [the screen of a part], and deletion. The change-notice object 16 expresses the content of modification made to the configuration data object 12. The change-management object 18 manages the created change-notice object 16, and sends the change-notice object 16 to the server process 5 at the generated order.

[0026] The configuration data object 22 and the object 24 for a display which are contained in one client process 20 are the same as each objects 12 and 14 on the client process 10, and it is generated corresponding to the part displayed regardless of the existence of update rights. Moreover, the client process 20 holds the table corresponding to an indicative data of the format same with having been shown in drawing 2 . The change-management object 28 manages the change-notice object 26 sent from the server process, uses renewal of the configuration data of the components which become the received order for modification as the configuration data object 22, and makes the object 24 for a display update

further. Although the change-notice object 26 expresses the content of modification made to the configuration data object like the change-notice object 16, in the case of this example, the content changed according to other client processes 10 is included. In addition, although explanation which has only a function required for modification and reflection in each client processes 10 and 20, respectively was given for convenience with the gestalt of this operation in order for the example which makes the content of modification in the client process 10 reflect in the client process 20 to explain, originally it has the equivalent function, respectively and bidirectional modification and reflection are possible.

[0027] The database process 3 manages the configuration database 31 which stores a part-shape data object. The configuration database 31 is an object oriented database. The management method of a part-shape data object is good in a general format.

[0028] The server process 5 has the change-notice server 51 which distributes the change-notice object created in each client process to a predetermined client process. It can know to which client process the received change-notice object will be distributed by referring to a part reference table as shown in drawing 3. A configuration data object and a file descriptor are matched and it is set to the part reference table which this server process 5 has. A file descriptor is uniquely assigned for every client process, when a client process is started and the server process 5 and a session are established. And if a part is displayed on a screen on the terminal unit with which each client process operates, ID of the configuration data object of the components relevant to the part then displayed will be notified to the server process 5. The server process 5 makes the file descriptor assigned to the client process which becomes the transmitting origin of received ID and its ID correspond, and is registered into a part reference table. The data registered into the part reference table are deleted when the display of components is stopped in each client process. Moreover, all the registration data relevant to the client process are deleted at the time of session termination with a client process. Setting-out processing to this part reference table is automatically performed according to starting of a client process, and dissipation.

[0029] Each above-mentioned processes 3, 5, 10, and 20 operate on a common computer on a CAD system as shown in drawing 4. Moreover, the table and part reference table corresponding to an indicative data are developed on the memory of the computer by which each process operates. However, although it is thought that it is common that each operates on one terminal unit, i.e., a data-processing means, assigned to each architect since it is generated per a design work unit and display screen as for each client process, when not only a gestalt such but two or more architects perform data processing simultaneously on one computer, it will live together on the computer. In subsequent explanation, it explains as that to which one client process operates on one terminal unit.

[0030] It being characteristic in the gestalt of this operation is having prepared the above configuration, and it is granting update rights simultaneously to two or more architects who receive one part, without producing inconvenience in any way, carrying out a concurrency to one part, and having been made to be possible [a design]. Moreover, it is having enabled it to display the content of a design / correction on real time by other architects.

[0031] Next, when the configuration of components is changed in the client process 10, actuation until the content of modification is sent and reflected in the client process 20 is explained based on the flow chart shown in drawing 5. In addition, one component is explained here as what consists of one configuration data object, although usually constituted by two or more configuration data objects.

[0032] First, supposing the architect who operates the client process 10 corrects on a screen the configuration of components where the command of CAD is published etc. (step 11), inside, the configuration data object 12 will be changed (step 12). If the configuration data object 12 is changed, it is going to update the content of the configuration database 31 on real time by the updating method (step 13). If the updating demand from the client process 10 is received, the database process 3 will perform an updating demand in order, and will update the content of the configuration database 31 serially (step 13). The configuration data object 12 generates the change-notice object 16 with renewal of the configuration database 31 (step 14). The change-notice object 16 serves as information not only the reason of client process 10 self but for notifying to other client processes 20 including the changed purport. One change-notice object 16 will usually be generated, if one CAD command changes chisels,

such as one configuration. The generated change-notice object 16 is registered into the queue which the change-management object 18 manages. And the change-management object 18 directs updating with reference to the table corresponding to an indicative data to the object 14 for a display which calls an updating method and is matched. For example, supposing ID of the configuration data object 12 changed in drawing 2 is "A1", ID will issue updating directions to the object 14 for a display of "B1", "B-2", and "B3." The object 14 for a display updates itself with configuration data based on the modification information which is included in directions at this time and passed as an argument (step 15). I hear that the configuration of the components which form a part of part displayed on the screen was updated effectively, and updating oneself has it.

[0033] Update rights are given by a series of above actuation, correction of the configuration of the part which is an object for a design etc. is effectively made by the architect, and a screen is displayed in the condition after correction.

[0034] Furthermore, in the client process 10, the change-management object 18 transmits the change-notice object 16 to ejection and the server process 5 from a queue one by one. In the gestalt of this operation, since each process is connected using a socket, before transmitting the change-notice object 16, conversion to text format is performed.

[0035] If a change notice is received (step 21), since the change-notice server 51 can know modification to which configuration data object it is from the content of the change notice, it obtains the file descriptor which searches a part reference table and corresponds based on the configuration data object used as this object for modification. That is, the change-notice server 51 can specify the client process which shows on a screen the part currently expressed with the configuration data object by searching a part reference table (step 22). Therefore, the change-notice server 51 delivers the change notice received to the specified client process (step 23). In addition, in the client process which is the transmitting origin of a change notice, since the display on a screen is already updated itself, it is not necessary to deliver a change notice. For example, although the change-notice server 51 tends to deliver a change notice to the client process whose file descriptors are "FD1" and "FD2" with reference to the part reference table shown in drawing 3 supposing ID of the changed configuration data object 12 is "A1" If the file descriptor of the client process 10 which changed the configuration data object 12 whose ID is "A1" is "FD1", a file descriptor will deliver a change notice to the client process which is "FD2."

[0036] After the change-management object 28 of the client process 20 to which the change notice has been sent changes the change notice into the change-notice object 26 and reverts, it carries out sequential registration at the queue to manage (step 31). The change-management object 28 performs updating directions in the configuration data object 22 list which calls and corresponds the registered change-notice object 26 in ejection and an updating method one by one at the object 24 for a display. It can be specified using the advice information included in the change-notice object 26 to which configuration data object 22 updating directions are issued. The configuration data object 22 accesses the configuration database 31, reads only the content of a design / correction over components, and updates the configuration data of the components concerned in the client process 20 based on this read modification top (step 32). Moreover, the object 24 for a display used as the object for updating can be obtained by referring to the table corresponding to an indicative data. The object 24 for a display updates itself with the configuration data already updated based on advice information (step 33). By updating oneself, the configuration of the components which form a part of part displayed on the screen can be updated effectively.

[0037] The correction made according to the client process 10 as mentioned above can be reflected also in the client process 20 on real time. That is, in the client process 20, when having not acquired update rights to the part which the client process 10 makes applicable to a design (i.e., when only reference is performing the part set as the design object of the client process 10), the content of modification performed according to the client process 10 is reflected by real time on the screen in the client process 20. Moreover, since only the part which the client process 10 performed is changed even if it is the same part when the client process 20 has acquired update rights to the same part as the object for a design of the client process 10 (i.e., when carrying out a concurrency to the client process 10 and designing the

same part), the content of the correction which the client process 20 is doing is overwritten, and it does not disappear.

[0038] Thus, in the gestalt of this operation, it can design by carrying out a concurrency to the same part.

[0039] In addition, in the case of two client processes, the above-mentioned explanation explained, but it is possible to apply, even when two or more client processes with the configuration which it was not restricted to this and mentioned above exist. In this case, although the change notice from two or more client processes will be received through the server process 5, since it is contained, Information ID, i.e., the configuration data object, which can specify the configuration data object used as the object for modification as a change notice, the change-management object in each client process can perform the same satisfactory processing as the above, even if every client process becomes a transmitting agency.

[0040] Moreover, since a change notice is delivered based on the content of setting out of a part reference table as mentioned above, the server process 5 can be established even if common to every components (component), every [which perform a design] product (model), and two or more models.

[0041] By the way, in the above explanation, although it says that two or more architects can design in parallel the components contained to the same part, two or more architects can change the same components almost simultaneous. For example, the change notice of "deleting the element of No. 5" from the client process 10 may reach the midst into which the command of "moving the element (components) of No. 5 in the direction of X 10mm" is inputted in the client process 20. At this time, if it is going to execute the migration instruction in the client process 20, conflict will arise. Then, in the gestalt of this operation, such a case is cancelable as follows.

[0042] First, the activated state is held as configuration data status information which sets up whether the configuration data objects 12 and 22 have effective existence of each configuration data, and when the configuration data objects 12 and 22 showing configuration data are created, "ON" is set up as an activated state. And when a Delete command is published to the components corresponding to the configuration data objects 12 and 22, if this activated state is "ON", it will switch to "OFF." In addition, even if a Delete command is executed effectively, it does not carry out deleting the configuration data objects 12 and 22 actually. It is because it must be made to revive by the undoing function. Since the activated state is already turned "off" even if a migration command [as opposed to / in the client process 20 / at this time / the element of No. 5 by the architect] is published, that migration command is not received as an error. Thus, the consistency as the whole system can be maintained, without producing conflict in the configuration of components.

[0043] To the modification information which the client process which made a design and correction creates with the gestalt 1 of the gestalt 2. above-mentioned implementation of operation Although other client processes which only the information which notifies the changed purport was included and were carrying out a screen display of the components had read the actual content of a design / correction from the configuration database 31 With the gestalt of this operation, it is characterized by making it include the actual content of a design / correction in modification information.

[0044] That is, the configuration data object 12 in the gestalt of this operation creates modification information according to the content of the design and correction which updated the configuration database 31. For example, the actual content of modification will be included in modification information like "an addition, a line element, a point (0, 0, 0), and a point (100, 100, 0)", or "correction, an element ID 2 and migration" (4, 0, 0). Therefore, not only a change notice but the changed actual content will be delivered by other client processes. And in the client process 20 which received modification information, the configuration data object 22 and the object 24 for a display will update the content of a screen display in a configuration data list based on this modification information.

[0045] By the way, in the client process 10 which made a design and correction, since it is thought that a certain command is published and a design and correction are made, with the gestalt of this operation, only the command itself or the content about the difference before and behind activation of a design and correction is extracted, and only the content is created as modification information. And if a command etc. is performed based on the modification information in other client processes, the same environment

as the client process which made a design and correction should be generated. Especially a thing [a thing] the data which other components receive are overwritten since only the content of a design / correction over components is extracted and the configuration database was updated in the gestalt of this operation based on the extracted modification information is lost.

[0046] Although it dropped off using the technique, it enabled it to realize with the gestalt of this operation, although premised on using an object-oriented technique with the gestalt 1 of the gestalt 3. above-mentioned implementation of operation. Drawing 6 is the block block diagram having shown the gestalt of other operations of the design method by the team format in the CAD system concerning this invention. The design method in the gestalt of this operation consists of client processes 60 and 70 generated in case it designs, and a server process 80 which carries out package management of the contents of a design / correction, such as a configuration of the part used as the object for a design. The client processes 60 and 70 are made to correspond for every display screens, such as a design work unit, and are generated. However, the gestalt of this operation explains as that to which each client processes 60 and 70 operate like the gestalt 1 of the above-mentioned implementation on one computer which is each data-processing means.

[0047] Each client processes 60 and 70 have the configuration data modification sections 61 and 71 with the same processing facility, the advice sections 62 and 72 of modification information, and the indicative-data Management Department 63 and 73, respectively. The configuration data modification sections 61 and 71 extract only the content of a design / correction of the components which performed the content of modification, i.e., a design and correction, and create it as modification information while they change the configuration data on memory. Moreover, management of the configuration data on memory, such as renewal of the configuration database 90 based on loading or modification information on the memory top of configuration data, and access to the configuration database 90 are performed. The advice sections 62 and 72 of modification information transmit the modification information which the configuration data modification sections 61 and 71 generated to the server process 80 on real time. Although the indicative-data Management Department 63 and 73 generates an indicative data based on the configuration data on memory, it updates the part shape by which a screen display was carried out by updating an indicative data with renewal of configuration data on real time.

[0048] The server process 80 has the modification information storage section 82 which accumulates the modification information which the client processes 60 and 70 in a team generate as hysteresis information one by one for every part, and the modification Research and Data Processing Department 81 which does control management of the update rights to the modification information accumulated in the modification information storage section 82. Especially the modification Research and Data Processing Department 81 controls exclusively by operating as a semaphore.

[0049] In the gestalt of this operation, it is characterized by establishing the means which carries out hysteresis management of a semaphore and the modification information for every part in this way. Although it is the conceptual diagram having shown on the table the modification information hysteresis information memorized by the modification information storage section 82, the identification information and the actual content of modification of the client process which become the transmitting origin of the serial number and modification information whenever modification information is memorized make drawing 7 a group, and it is accumulated. Since the serial number was only prepared in order to clarify sequence which received modification information, it may use time, other assignment-of-drawing-number approaches, etc. Moreover, unique ID is assigned to the identification information of a client process by the whole system.

[0050] Next, it explains using the flow chart which made the example the case where the configuration of components was changed in the client process 60, and was shown in drawing 8 about the actuation in the gestalt of this operation. In addition, it explains by the case where only the client process 60 has update rights first.

[0051] When the architect who operates the client process 60 starts the design of a part, the configuration data about the part are loaded to memory from the configuration database 90, and a screen display of the components contained to a part is carried out. If the command of CAD is published in

order to make the content of correction reflect after an architect makes correction on a screen (step 41) (step 42), it will go [gaining the semaphore to the part used as the object for correction, and] (step 43). A semaphore is managed by the modification Research and Data Processing Department 81, and is prepared for every part. In addition, in this explanation, since update rights are given only to the client process 60, about steps 44-47, it mentions later.

[0052] If a semaphore can be gained, the configuration data modification section 61 will update activation of a command, i.e., the configuration data on memory, and will create modification information based on the content of updating (step 48). This modification information is accumulated in the modification information storage section 82 as a content of modification by latter processing. Although it is dependent on the application to operate, difference with the configuration data before modification is sufficient as the content of modification, and the command used for modification is sufficient as it. That is, since he is trying for the content of a display on the screen in other client processes to become the same as the transmitting origin in latter processing when other client processes read and perform modification information, the content of modification should just be based on a fixed regulation. Moreover, the indicative-data Management Department 63 will update the display on a screen, if configuration data are changed (step 49). In order to update, it is based on the modification information sent from the configuration data modification section 61. Thus, in the client process 60 which changed into configuration data, a screen display can be updated on real time. Next, the configuration data modification section 61 transmits the created modification information to the server process 80 (step 50).

[0053] If modification information is received, the modification Research and Data Processing Department 81 in the server process 80 will judge the part where modification was made, and will distribute and accumulate in the modification information storage section 82 prepared for every part.

[0054] The configuration data modification section 61 registers the configuration data changed after transmission of modification information based on the published command into the configuration database 90 (step 51). And a semaphore is released (step 52).

[0055] Thus, although configuration data can be updated on real time at the display list on the screen in the client process 60 into which it changed actually For the client process which starts reference of the part used as this object for modification, the modification Research and Data Processing Department 81 The information on the location (reflection starting position) of the modification information by which hysteresis is carried out to the modification information storage section 82 made to reflect to the configuration database 90 is held, and whenever the configuration database 90 is updated, it is necessary to move a reflection starting position.

[0056] Next, the actuation made to reflect in other client processes 70 of referring to the part containing the components which had the content of modification made in the client process 60 changed is explained.

[0057] The indicative-data Management Department 73 of the client process 70 is monitoring the content of the modification information storage section 82 continuously, and if the modification information over the part which is carrying out a screen display in the client process 70 is registered into the modification information storage section 82, it will read the modification information concerned. The indicative-data Management Department 73 becomes the same content about the configuration of the components which became the client process 60 which is the creation origin of modification information, and an object for modification by reflecting this modification information. If it explains to a detail, although the client process 70 reads the configuration data about a reference part from the configuration database 90 and they are loading and carrying out a screen display to memory, it should become the same as the content of the memory in the client process 60 to the components used as the object for modification by updating based on modification information to the configuration data on this memory. Thus, the same part shape can be displayed on real time by making the content of modification performed in other client processes reflect.

[0058] By the way, when two or more architects are designing in parallel according to the team format Usually, although it is desirable to monitor the content of the modification information storage section

82 continuously as above-mentioned, and to make the content of modification reflect in real time, it sets to the design method in the gestalt of this operation. The content of modification can be made to reflect in each client process to the timing of the time of reception of periodical or the broadcast message aiming at taking a synchronization etc., or arbitration. For example, the modification information reflection record table as bundled up to the modification Research and Data Processing Department 81 and shown in drawing 9 is set up for every part. The serial number of the modification information by the place that the content of a design / correction which other client processes performed in each client process was made to reflect on memory is recorded on this table. That is, the location of the modification information read from the modification information storage section 82 in each client process for renewal of a screen display is recorded on the modification information reflection record table. for example, what is necessary will be to carry out reading appearance of all the modification information of the 6th henceforth which is not made to still reflect in a screen display from the modification information storage section 82 if a screen display is changed into the condition of the newest and it excels, since the client process whose ID is 1 according to drawing 9 made the modification information to the 5th reflect and the display on a screen is updated, and just to carry out sequential execution In addition, without carrying out package management of the location (reflection location) of the modification information which each client process read in the modification Research and Data Processing Department 81, even if it makes it make each one of reflection locations manage in each client process, it can realize.

[0059] Thus, the content of modification can be made to reflect on a screen to the timing of arbitration in each client process. And if all client processes always read the newest modification information and you are trying to make it reflected on memory, the display of the newest part shape should be attained in the screen in all client processes. In addition, if it enables it to specify the serial number in each client process by using a modification information reflection record table, it is possible to also make even the modification information on the location of arbitration reflect in a screen display.

[0060] Next, actuation of the client process 60 when the client processes 60 and 70 have acquired the update rights of the same part simultaneously is made into an example, and actuation when two or more architects have acquired update rights is explained.

[0061] The client process 60 will gain a semaphore, if a command is published as mentioned above (steps 41-43). By the way, when the update process is performed by two or more persons (step 44), the modification information which other client processes 70 created should be registered into the modification information storage section 82. Moreover, as shown in drawing 9, each client process can know whether you made it reflected on a screen to which modification information in the part which self has updated. Therefore, by reading altogether the modification information on the part which is not reflected from the modification information storage section 82, and performing it, the client process 60 is made to reflect in the configuration data on memory, and can be changed into the newest condition (step 45). Since the indicative-data Management Department 63 updates an indicative data with renewal of configuration data at this time, a screen display of the newest part shape can be carried out. And the configuration data modification section 61 checks consistency of whether the published command can perform actually (step 46). This is because other architects execute a command and can change to the same components, while the architect did a screen display of the components and having inputted the command, and is because the command performed behind may be unable to perform normally in this case. For example, the case where the command that other architects delete the element of No. 5 is executed etc. corresponds at this during the input of the command which moves the element (components) of No. 5 in the direction of X 10mm. In such a case, the configuration data modification section 61 releases a semaphore, without making the content of modification reflect noting that it detects conflict, without the ability taking consistency (steps 47 and 52). In addition, it means that error status is returned to the architect who inputted the command, and the input command was canceled.

[0062] On the other hand, if consistency can be taken as a result of the check of consistency, as mentioned above, a command will be executed actually, the configuration data on memory, the content of a screen display, and the content of the configuration database 90 will be updated, respectively, and a

semaphore will be released (steps 48-52).

[0063] Thus, since the client process 60 was registered into the configuration database 90 after it made the content of modification by other client processes 70 read not only from the content of modification of self but from the modification information storage section 82 reflect in the configuration data on memory, without overwriting the content of a design / correction by other architects, and disappearing, it can carry out the concurrency of the design to the same components etc., and can perform it. In addition, when a screen display of other parts which have not acquired update rights is carried out, renewal only of the configuration data on memory is only possible, and it cannot be overemphasized that renewal of the configuration database 90 cannot be performed.

[0064] In addition, although only the part changed like the above-mentioned processing whenever it executed the command has updated the configuration database 90, the configuration data modification section 61 When partial renewal of data when the sequential file is being used as a database cannot be performed You may make it rewrite the whole round head by the data more than a memorandum collectively, just before ending a session rather than updating the configuration database 90 at every activation of a command. In addition, it is necessary to move the reflection starting position in the modification information storage section 82 even in this case.

[0065] Moreover, when other architects have already started the team design, each client process can change a screen display into the newest condition by reading and performing modification information from the modification information storage section 82, while reading configuration data from the configuration database 90.

[0066] Moreover, the modification information currently recorded on the modification information storage section 82 can be deleted, after it is reflected in the configuration database 90 and all working client processes make it reflected in memory.

[Translation done.]

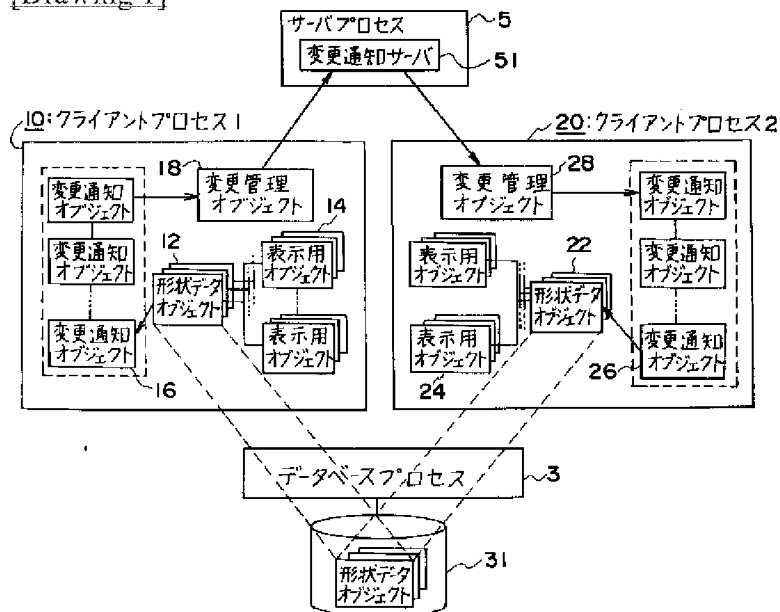
* NOTICES *

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DRAWINGS

[Drawing 1]



[Drawing 2]

表示データ対応テーブル

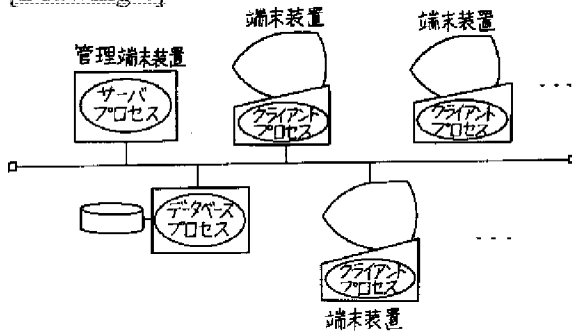
形状データ オブジェクトID	表示用 オブジェクトID
A1	B1
A1	B2
A1	B3
A2	B4
A2	B5
A3	B6
A4	B7
A4	B8
⋮	⋮

[Drawing 3]

部位参照テーブル

形状データ オブジェクトID	ファイル ディスクリプタ
A1	FD1
A1	FD2
A2	FD1
A3	FD2
A3	FD3
A3	FD4
A4	FD5
⋮	⋮

[Drawing 4]



[Drawing 7]

変更情報履歴情報

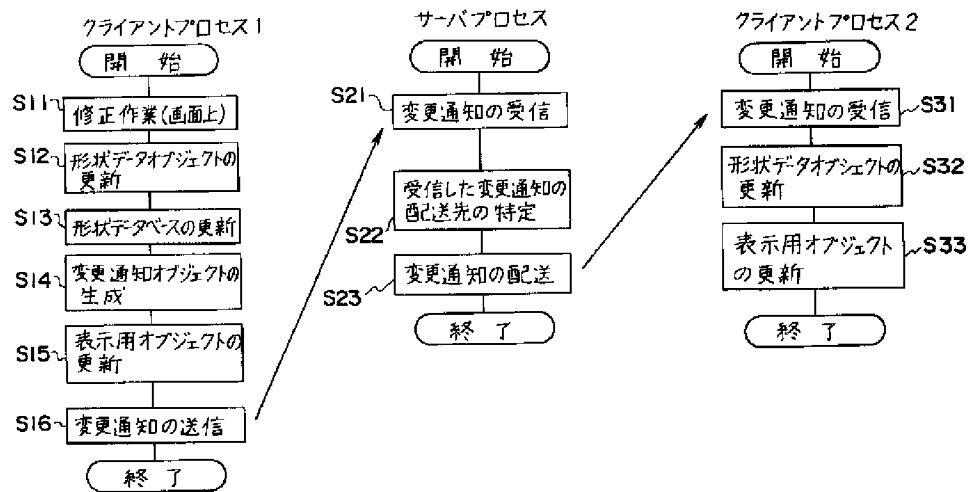
NO.	クライアント プロセスID	変更内容
1	1	A
2	1	B
3	2	C
4	1	D
5	2	E
⋮	⋮	⋮

[Drawing 9]

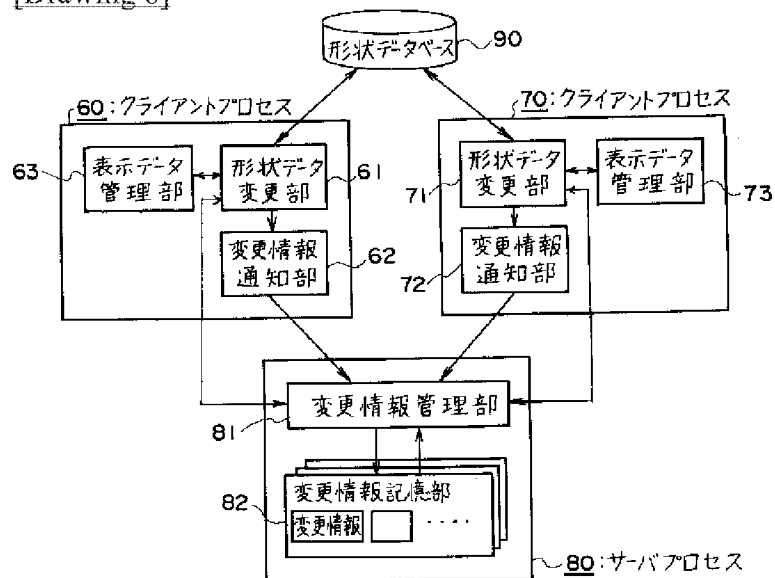
変更情報反映記録テーブル

クライアント プロセスID	NO.
1	5
2	8
⋮	⋮

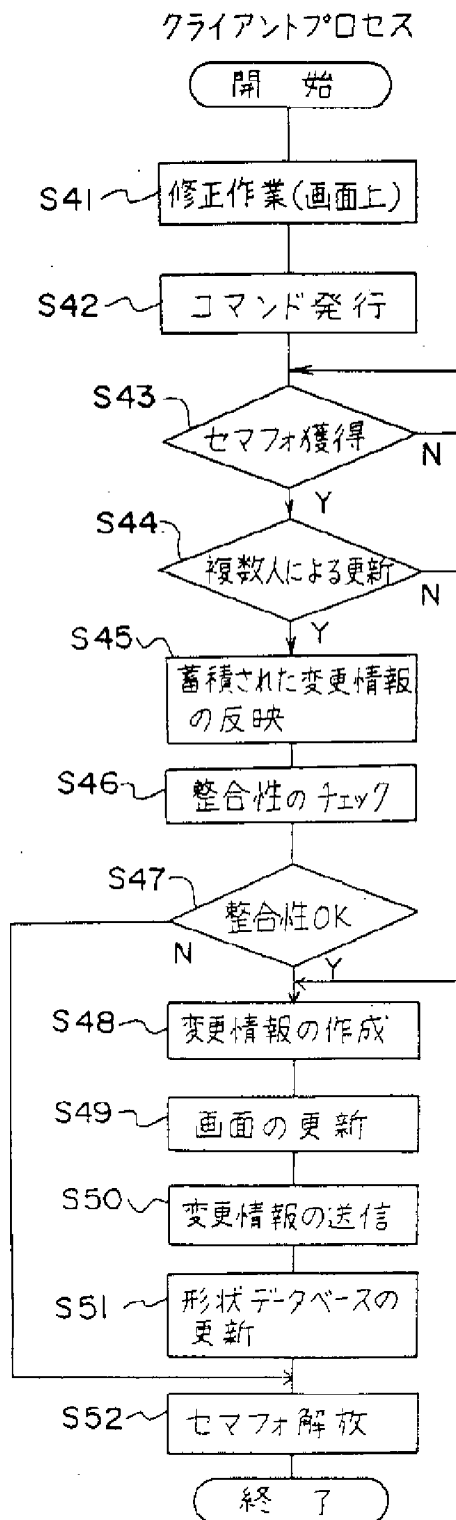
[Drawing 5]



[Drawing 6]



[Drawing 8]



[Translation done.]

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MEANS

[Means for Solving the Problem] In order to attain the above object, the design approach by the team format in the CAD system concerning the 1st invention It has two or more data-processing means which carry out a screen display of the components contained in the object for a design managed in a shared configuration database. In the CAD system to which two or more architects design the components assigned to each through said each data-processing means in a team format The modification information which carries out Seki only to the design and correction to the components which made a design and correction is created, and it is characterized by updating the screen display of only the components concerned in said each data-processing means in the updating list of only the components concerned stored in said configuration database based on the modification information.

[0009] The design method by the team format in the CAD system concerning the 2nd invention It has two or more data-processing means which carry out a screen display of the components contained in the object for a design managed in a shared configuration database. In the CAD system to which two or more architects design the components assigned to each through said each data-processing means in a team format The renewal means of configuration data which updates said configuration database based on the content of a design / correction which the architect did, A modification information creation means to create the information which carries out Seki only to a design and correction of the components which made a design and correction as modification information, An advice means of modification information to deliver the components set as the object of a design and correction in the created modification information to said each data-processing means which is carrying out a screen display, It is characterized by having the renewal means of the display screen which updates the display screen of said data-processing means to display the components set as the object of a design and correction based on the delivered modification information, and carrying out by carrying out the concurrency of a design and the correction of the components contained in the same object for a design.

[0010] The design method by the team format in the CAD system concerning the 3rd invention Two or more clients which a screen display of the components set as the object of a design and correction is carried out [clients], and make a design give an architect, The server which manages the address for delivery of the modification information sent from said each client, In the CAD system to which it has the shared configuration database which stores the configuration data of the components contained in the object for a design, and two or more architects design the components assigned to each through said each client in a team format Said each client on which a design and correction of components are made The renewal means of configuration data which updates said configuration database based on the content of a design / correction which the architect did, A modification information creation means to create the information which carries out Seki only to a design and correction of the components which made a design and correction as modification information, It has a modification information transmitting means to transmit modification information to said server. Said server A means to memorize the client reference table to which the components in which said client and said each client are carrying out a screen display were made equivalent, Said client which is carrying out a screen display of the components in connection with the sent modification information is specified by referring to said client

reference table. Said client which is referring to the components which have an advice means of modification information to deliver the modification information concerned to said each of that specified client, and were set as the object of a design and correction. It is characterized by having a renewal means of the display screen to update the content of a display of the components set as the object of a design and correction, based on the received modification information.

[0011] The 4th invention is set to invention of the 2nd or 3rd either of the above. Said modification information creation means Modification information is created as advice information which notifies that there were a design and correction. Said renewal means of the display screen It is characterized by reading only the content of a design / correction of the components which made a design and correction from said configuration database according to the advice using the received modification information, and updating the content of a display of components.

[0012] The 5th invention creates only the content of a design / correction with said actual modification information creation means as modification information in invention of the 2nd or 3rd either of the above, and it carries out that said renewal means of the display screen updates the content of a display of the components set as the object of a design and correction based on the content included in the received modification information as the description.

[0013] In invention of the 2nd or 3rd either of the above, said configuration database of the 6th invention is an object oriented database, and said each other means are characterized by realizing by object-oriented.

[0014] 7th invention is characterized by holding the configuration data status information which sets up whether said renewal means of configuration data has effective existence of the configuration data corresponding to each part article in invention of the 2nd or 3rd either of the above. [whether according to this invention, the configuration data corresponding to the components concerned which components were created on the screen and generated in connection with it exist effectively, and] Or components were deleted from the display screen, or (in this case, actual configuration data are not deleted but it only becomes invalid that existing them) The configuration data status information to say was held, and it was made not to receive, though the variation order of configuration data was issued when the content of configuration data status information was an invalid. Since the migration instruction is not received by this even when a migration instruction is issued immediately after the deletion instruction of for example, configuration data, conflict does not arise by the content of a design.

[0015] The design approach by the team format in the CAD system concerning the 8th invention In the CAD system to which it has two or more data-processing means which carry out a screen display of the components contained in the object for a design, and two or more architects design the components assigned to each through said each data-processing means in a team format The step which updates the configuration data of the components stored in the configuration database data-processing means shared [said] based on the content of a design / correction which the architect did, The step which updates configuration data through said one of data-processing means, The step which creates the modification information which carries out Seki only to a design and correction of the components with which a design and correction were made, The step which delivers the components set as the object of a design and correction in the created modification information to said each data-processing means which is carrying out a screen display, It is characterized by having the step which updates the display screen of said data-processing means to display the components set as the object of a design and correction based on the delivered modification information, and carrying out by carrying out the concurrency of a design and the correction of the components contained in the same object for a design.

[0016] In the above-mentioned invention, although it is thought that the data-processing means or client which made a design and correction publishes a certain command, and makes a design and correction, only the command itself or the content about the difference before and behind activation of a design and correction is extracted, and if you make it reflected because activation etc. carries out only the content also in other data-processing means, it should become the content of the same screen display. Therefore, only the content of a design / correction over components is extracted, and it was made to become the same content of a display in this invention in all the data-processing means that are carrying out a screen

display of the component by performing the extracted content in each data-processing means to display the component etc. It seems that moreover, the configuration data of other components are overwritten and it does not disappear in the above-mentioned invention since the configuration database was updated only based on the content of a design / correction over components. That is, according to this invention, a concurrency can be carried out by two or more architects to the same part, and a design and correction can be made.

[0017] Moreover, the design method by the team format in the CAD system concerning the 9th invention It has two or more data-processing means which carry out a screen display of said component by loading on memory the configuration data of the components contained in the object for a design managed in a shared configuration database. In the CAD system to which two or more architects design the components assigned to each through said each data-processing means in a team format A modification information creation means to extract only the content of a design / correction of the components which made a design and correction, and to create as modification information, The modification information hysteresis storage means which carries out sequential are recording of the modification information created in the team, The exclusive control means which carries out control management of the update rights to the modification information accumulated in said modification information hysteresis storage means, After acquiring update rights with said exclusive control means, all the modification information about the components contained in the object for a design is read from said modification information hysteresis storage means. A configuration data control means to update the configuration data on said memory based on the read modification information, and to perform renewal of the configuration data on said memory, and said configuration database by executing the inputted command, It is characterized by having the indicative-data management tool which performs the screen display of components based on the configuration data on said memory.

[0018] It is characterized by for the 10th invention to have a modification information reflection record means record the location of the modification information read from said modification information hysteresis storage means in each of said data-processing means in the 9th invention, and for said configuration data-control means to read the modification information to the location of arbitration from said modification information hysteresis storage means, and to make it reflected on said memory.

[0019] 11th invention is characterized by for said configuration data control means reading only the modification information which is not made to reflect on said memory among the modification information about the components contained in the object for a design from said modification information hysteresis storage means, and updating the configuration data on said memory in the 10th invention.

[0020] 12th invention is characterized by for said configuration data control means carrying out reading appearance of the modification information serially from said modification information hysteresis storage means, whenever the modification information about the components contained in the object for a design is accumulated, and updating the configuration data on said memory in the 11th invention.

[0021] Furthermore, the design method by the team format in the CAD system concerning the 13th invention Two or more clients which a screen display of said component is carried out [clients], and make a design give an architect by loading on memory the configuration data of the components set as the object of a design and correction, The server which carries out package management of the content of a design / correction in said each client, In the CAD system to which it has the shared configuration database which stores the configuration data of the components contained in the object for a design, and two or more architects design the components assigned to each through said each client in a team format A modification information creation means for said client to extract only the content of a design / correction of the components which made a design and correction, and to create as modification information, It has an advice means of modification information to send the created modification information to said server. Said server The modification information hysteresis storage means which carries out sequential are recording of the modification information sent from said client, It has the exclusive control means which carries out control management of the update rights to the modification information accumulated in said modification information hysteresis storage means. Said client

Furthermore, after acquiring update rights with said exclusive control means, all the modification information about the components contained in the object for a design is read from said modification information hysteresis storage means. A configuration data control means to update the configuration data on said memory based on the read modification information, and to perform renewal of the configuration data on said memory, and said configuration database by executing the inputted command. It is characterized by having the indicative-data management tool which performs the screen display of components based on the configuration data on said memory.

[0022] According to the above-mentioned invention, hysteresis management of the modification information which extracted and created only the command itself which made a design and correction, for example, or the content about the difference before and behind activation of a design and correction is carried out. Since it was made to perform renewal of a screen display, and renewal of a configuration database in each data-processing means or each client based on the modification information While being able to make the content of a design / correction which other architects did reflect in a self screen display, a configuration database can be updated without overwriting. Thereby, a concurrency can be carried out by two or more architects to the same part, and a design and correction can be made.

[0023]

[Embodiment of the Invention] Hereafter, based on a drawing, the gestalt of each suitable operation of this invention is explained.

[0024] Gestalt 1. drawing 1 of operation is the block block diagram having shown the gestalt of 1 operation of the design method by the team format in the CAD system concerning this invention. The design method in the gestalt of this operation consists of client processes 10 and 20, a database process 3, and a server process 5, and contains the object, respectively.

[0025] The client processes 10 and 20 are made to correspond for every display screens, such as a terminal unit which is a design work unit, i.e., a data-processing means, and are generated. The configuration data object 12 contained in the client process 10 is an application object, for example, expresses configuration data, such as a line and a field. The object 14 for a display is an object depending on the configuration data object 12, for example, is data on the display screen showing a line, a field, etc. About each part, it is expressed by two or more configuration data objects 12, and is usually displayed by two or more objects 14 for a display. Since it is an object required in order to carry out a screen display, the configuration data object 12 and the object 14 for a display are generated also to the part on the screen which not only the part set as the design object of self but other persons are designing. Conversely, if it says, in case a part will be displayed on a screen, the configuration data object 12 and the object 14 for a display of each part article which are contained to the part are generated. And the configuration data object 12 and the object 14 for a display are associated and managed on the table corresponding to an indicative data as shown in drawing 2 . One object 14 for a display is usually generated corresponding to the configuration data object 12, and when a different format, for example, drawing and a numerical table, expresses a certain configuration data, two or more generation of it is carried out. Setting out on the table corresponding to an indicative data is automatically performed with the display of a up to [the screen of a part], and deletion. The change-notice object 16 expresses the content of modification made to the configuration data object 12. The change-management object 18 manages the created change-notice object 16, and sends the change-notice object 16 to the server process 5 at the generated order.

[0026] The configuration data object 22 and the object 24 for a display which are contained in one client process 20 are the same as each objects 12 and 14 on the client process 10, and it is generated corresponding to the part displayed regardless of the existence of update rights. Moreover, the client process 20 holds the table corresponding to an indicative data of the format same with having been shown in drawing 2 . The change-management object 28 manages the change-notice object 26 sent from the server process, uses renewal of the configuration data of the components which become the received order for modification as the configuration data object 22, and makes the object 24 for a display update further. Although the change-notice object 26 expresses the content of modification made to the configuration data object like the change-notice object 16, in the case of this example, the content

changed according to other client processes 10 is included. In addition, although explanation which has only a function required for modification and reflection in each client processes 10 and 20, respectively was given for convenience with the gestalt of this operation in order for the example which makes the content of modification in the client process 10 reflect in the client process 20 to explain, originally it has the equivalent function, respectively and bidirectional modification and reflection are possible.

[0027] The database process 3 manages the configuration database 31 which stores a part-shape data object. The configuration database 31 is an object oriented database. The management method of a part-shape data object is good in a general format.

[0028] The server process 5 has the change-notice server 51 which distributes the change-notice object created in each client process to a predetermined client process. It can know to which client process the received change-notice object will be distributed by referring to a part reference table as shown in drawing 3. A configuration data object and a file descriptor are matched and it is set to the part reference table which this server process 5 has. A file descriptor is uniquely assigned for every client process, when a client process is started and the server process 5 and a session are established. And if a part is displayed on a screen on the terminal unit with which each client process operates, ID of the configuration data object of the components relevant to the part then displayed will be notified to the server process 5. The server process 5 makes the file descriptor assigned to the client process which becomes the transmitting origin of received ID and its ID correspond, and is registered into a part reference table. The data registered into the part reference table are deleted when the display of components is stopped in each client process. Moreover, all the registration data relevant to the client process are deleted at the time of session termination with a client process. Setting-out processing to this part reference table is automatically performed according to starting of a client process, and dissipation.

[0029] Each above-mentioned processes 3, 5, 10, and 20 operate on a common computer on a CAD system as shown in drawing 4. Moreover, the table and part reference table corresponding to an indicative data are developed on the memory of the computer by which each process operates. However, although it is thought that it is common that each operates on one terminal unit, i.e., a data-processing means, assigned to each architect since it is generated per a design work unit and display screen as for each client process, when not only a gestalt such but two or more architects perform data processing simultaneously on one computer, it will live together on the computer. In subsequent explanation, it explains as that to which one client process operates on one terminal unit.

[0030] It being characteristic in the gestalt of this operation is having prepared the above configuration, and it is granting update rights simultaneously to two or more architects who receive one part, without producing inconvenience in any way, carrying out a concurrency to one part, and having been made to be possible [a design]. Moreover, it is having enabled it to display the content of a design / correction on real time by other architects.

[0031] Next, when the configuration of components is changed in the client process 10, actuation until the content of modification is sent and reflected in the client process 20 is explained based on the flow chart shown in drawing 5. In addition, one component is explained here as what consists of one configuration data object, although usually constituted by two or more configuration data objects.

[0032] First, supposing the architect who operates the client process 10 corrects on a screen the configuration of components where the command of CAD is published etc. (step 11), inside, the configuration data object 12 will be changed (step 12). If the configuration data object 12 is changed, it is going to update the content of the configuration database 31 on real time by the updating method (step 13). If the updating demand from the client process 10 is received, the database process 3 will perform an updating demand in order, and will update the content of the configuration database 31 serially (step 13). The configuration data object 12 generates the change-notice object 16 with renewal of the configuration database 31 (step 14). The change-notice object 16 serves as information not only the reason of client process 10 self but for notifying to other client processes 20 including the changed purport. One change-notice object 16 will usually be generated, if one CAD command changes chisels, such as one configuration. The generated change-notice object 16 is registered into the queue which the change-management object 18 manages. And the change-management object 18 directs updating with

reference to the table corresponding to an indicative data to the object 14 for a display which calls an updating method and is matched. For example, supposing ID of the configuration data object 12 changed in drawing 2 is "A1", ID will issue updating directions to the object 14 for a display of "B1", "B-2", and "B3." The object 14 for a display updates itself with configuration data based on the modification information which is included in directions at this time and passed as an argument (step 15). I hear that the configuration of the components which form a part of part displayed on the screen was updated effectively, and updating oneself has it.

[0033] Update rights are given by a series of above actuation, correction of the configuration of the part which is an object for a design etc. is effectively made by the architect, and a screen is displayed in the condition after correction.

[0034] Furthermore, in the client process 10, the change-management object 18 transmits the change-notice object 16 to ejection and the server process 5 from a queue one by one. In the gestalt of this operation, since each process is connected using a socket, before transmitting the change-notice object 16, conversion to text format is performed.

[0035] If a change notice is received (step 21), since the change-notice server 51 can know modification to which configuration data object it is from the content of the change notice, it obtains the file descriptor which searches a part reference table and corresponds based on the configuration data object used as this object for modification. That is, the change-notice server 51 can specify the client process which shows on a screen the part currently expressed with the configuration data object by searching a part reference table (step 22). Therefore, the change-notice server 51 delivers the change notice received to the specified client process (step 23). In addition, in the client process which is the transmitting origin of a change notice, since the display on a screen is already updated itself, it is not necessary to deliver a change notice. For example, although the change-notice server 51 tends to deliver a change notice to the client process whose file descriptors are "FD1" and "FD2" with reference to the part reference table shown in drawing 3 supposing ID of the changed configuration data object 12 is "A1" If the file descriptor of the client process 10 which changed the configuration data object 12 whose ID is "A1" is "FD1", a file descriptor will deliver a change notice to the client process which is "FD2."

[0036] After the change-management object 28 of the client process 20 to which the change notice has been sent changes the change notice into the change-notice object 26 and reverts, it carries out sequential registration at the queue to manage (step 31). The change-management object 28 performs updating directions in the configuration data object 22 list which calls and corresponds the registered change-notice object 26 in ejection and an updating method one by one at the object 24 for a display. It can be specified using the advice information included in the change-notice object 26 to which configuration data object 22 updating directions are issued. The configuration data object 22 accesses the configuration database 31, reads only the content of a design / correction over components, and updates the configuration data of the components concerned in the client process 20 based on this read modification top (step 32). Moreover, the object 24 for a display used as the object for updating can be obtained by referring to the table corresponding to an indicative data. The object 24 for a display updates itself with the configuration data already updated based on advice information (step 33). By updating oneself, the configuration of the components which form a part of part displayed on the screen can be updated effectively.

[0037] The correction made according to the client process 10 as mentioned above can be reflected also in the client process 20 on real time. That is, in the client process 20, when having not acquired update rights to the part which the client process 10 makes applicable to a design (i.e., when only reference is performing the part set as the design object of the client process 10), the content of modification performed according to the client process 10 is reflected by real time on the screen in the client process 20. Moreover, since only the part which the client process 10 performed is changed even if it is the same part when the client process 20 has acquired update rights to the same part as the object for a design of the client process 10 (i.e., when carrying out a concurrency to the client process 10 and designing the same part), the content of the correction which the client process 20 is doing is overwritten, and it does not disappear.

[0038] Thus, in the gestalt of this operation, it can design by carrying out a concurrency to the same part.

[0039] In addition, in the case of two client processes, the above-mentioned explanation explained, but it is possible to apply, even when two or more client processes with the configuration which it was not restricted to this and mentioned above exist. In this case, although the change notice from two or more client processes will be received through the server process 5, since it is contained, Information ID, i.e., the configuration data object, which can specify the configuration data object used as the object for modification as a change notice, the change-management object in each client process can perform the same satisfactory processing as the above, even if every client process becomes a transmitting agency.

[0040] Moreover, since a change notice is delivered based on the content of setting out of a part reference table as mentioned above, the server process 5 can be established even if common to every components (component), every [which perform a design] product (model), and two or more models.

[0041] By the way, in the above explanation, although it says that two or more architects can design in parallel the components contained to the same part, two or more architects can change the same components almost simultaneous. For example, the change notice of "deleting the element of No. 5" from the client process 10 may reach the midst into which the command of "moving the element (components) of No. 5 in the direction of X 10mm" is inputted in the client process 20. At this time, if it is going to execute the migration instruction in the client process 20, conflict will arise. Then, in the gestalt of this operation, such a case is cancelable as follows.

[0042] First, the activated state is held as configuration data status information which sets up whether the configuration data objects 12 and 22 have effective existence of each configuration data, and when the configuration data objects 12 and 22 showing configuration data are created, "ON" is set up as an activated state. And when a Delete command is published to the components corresponding to the configuration data objects 12 and 22, if this activated state is "ON", it will switch to "OFF." In addition, even if a Delete command is executed effectively, it does not carry out deleting the configuration data objects 12 and 22 actually. It is because it must be made to revive by the undoing function. Since the activated state is already turned "off" even if a migration command [as opposed to / in the client process 20 / at this time / the element of No. 5 by the architect] is published, that migration command is not received as an error. Thus, the consistency as the whole system can be maintained, without producing conflict in the configuration of components.

[0043] To the modification information which the client process which made a design and correction creates with the gestalt 1 of the gestalt 2. above-mentioned implementation of operation Although other client processes which only the information which notifies the changed purport was included and were carrying out a screen display of the components had read the actual content of a design / correction from the configuration database 31 With the gestalt of this operation, it is characterized by making it include the actual content of a design / correction in modification information.

[0044] That is, the configuration data object 12 in the gestalt of this operation creates modification information according to the content of the design and correction which updated the configuration database 31. For example, the actual content of modification will be included in modification information like "an addition, a line element, a point (0, 0, 0), and a point (100, 100, 0)", or "correction, an element ID 2 and migration" (4, 0, 0). Therefore, not only a change notice but the changed actual content will be delivered by other client processes. And in the client process 20 which received modification information, the configuration data object 22 and the object 24 for a display will update the content of a screen display in a configuration data list based on this modification information.

[0045] By the way, in the client process 10 which made a design and correction, since it is thought that a certain command is published and a design and correction are made, with the gestalt of this operation, only the command itself or the content about the difference before and behind activation of a design and correction is extracted, and only the content is created as modification information. And if a command etc. is performed based on the modification information in other client processes, the same environment as the client process which made a design and correction should be generated. Especially a thing [a thing] the data which other components receive are overwritten since only the content of a design /

correction over components is extracted and the configuration database was updated in the gestalt of this operation based on the extracted modification information is lost.

[0046] Although it dropped off using the technique, it enabled it to realize with the gestalt of this operation, although premised on using an object-oriented technique with the gestalt 1 of the gestalt 3. above-mentioned implementation of operation. Drawing 6 is the block block diagram having shown the gestalt of other operations of the design method by the team format in the CAD system concerning this invention. The design method in the gestalt of this operation consists of client processes 60 and 70 generated in case it designs, and a server process 80 which carries out package management of the contents of a design / correction, such as a configuration of the part used as the object for a design. The client processes 60 and 70 are made to correspond for every display screens, such as a design work unit, and are generated. However, the gestalt of this operation explains as that to which each client processes 60 and 70 operate like the gestalt 1 of the above-mentioned implementation on one computer which is each data-processing means.

[0047] Each client processes 60 and 70 have the configuration data modification sections 61 and 71 with the same processing facility, the advice sections 62 and 72 of modification information, and the indicative-data Management Department 63 and 73, respectively. The configuration data modification sections 61 and 71 extract only the content of a design / correction of the components which performed the content of modification, i.e., a design and correction, and create it as modification information while they change the configuration data on memory. Moreover, management of the configuration data on memory, such as renewal of the configuration database 90 based on loading or modification information on the memory top of configuration data, and access to the configuration database 90 are performed. The advice sections 62 and 72 of modification information transmit the modification information which the configuration data modification sections 61 and 71 generated to the server process 80 on real time. Although the indicative-data Management Department 63 and 73 generates an indicative data based on the configuration data on memory, it updates the part shape by which a screen display was carried out by updating an indicative data with renewal of configuration data on real time.

[0048] The server process 80 has the modification information storage section 82 which accumulates the modification information which the client processes 60 and 70 in a team generate as hysteresis information one by one for every part, and the modification Research and Data Processing Department 81 which does control management of the update rights to the modification information accumulated in the modification information storage section 82. Especially the modification Research and Data Processing Department 81 controls exclusively by operating as a semaphore.

[0049] In the gestalt of this operation, it is characterized by establishing the means which carries out hysteresis management of a semaphore and the modification information for every part in this way. Although it is the conceptual diagram having shown on the table the modification information hysteresis information memorized by the modification information storage section 82, the identification information and the actual content of modification of the client process which become the transmitting origin of the serial number and modification information whenever modification information is memorized make drawing 7 a group, and it is accumulated. Since the serial number was only prepared in order to clarify sequence which received modification information, it may use time, other assignment-of-drawing-number approaches, etc. Moreover, unique ID is assigned to the identification information of a client process by the whole system.

[0050] Next, it explains using the flow chart which made the example the case where the configuration of components was changed in the client process 60, and was shown in drawing 8 about the actuation in the gestalt of this operation. In addition, it explains by the case where only the client process 60 has update rights first.

[0051] When the architect who operates the client process 60 starts the design of a part, the configuration data about the part are loaded to memory from the configuration database 90, and a screen display of the components contained to a part is carried out. If the command of CAD is published in order to make the content of correction reflect after an architect makes correction on a screen (step 41) (step 42), it will go [gaining the semaphore to the part used as the object for correction, and] (step 43).

A semaphore is managed by the modification Research and Data Processing Department 81, and is prepared for every part. In addition, in this explanation, since update rights are given only to the client process 60, about steps 44-47, it mentions later.

[0052] If a semaphore can be gained, the configuration data modification section 61 will update activation of a command, i.e., the configuration data on memory, and will create modification information based on the content of updating (step 48). This modification information is accumulated in the modification information storage section 82 as a content of modification by latter processing. Although it is dependent on the application to operate, difference with the configuration data before modification is sufficient as the content of modification, and the command used for modification is sufficient as it. That is, since he is trying for the content of a display on the screen in other client processes to become the same as the transmitting origin in latter processing when other client processes read and perform modification information, the content of modification should just be based on a fixed regulation. Moreover, the indicative-data Management Department 63 will update the display on a screen, if configuration data are changed (step 49). In order to update, it is based on the modification information sent from the configuration data modification section 61. Thus, in the client process 60 which changed into configuration data, a screen display can be updated on real time. Next, the configuration data modification section 61 transmits the created modification information to the server process 80 (step 50).

[0053] If modification information is received, the modification Research and Data Processing Department 81 in the server process 80 will judge the part where modification was made, and will distribute and accumulate in the modification information storage section 82 prepared for every part.

[0054] The configuration data modification section 61 registers the configuration data changed after transmission of modification information based on the published command into the configuration database 90 (step 51). And a semaphore is released (step 52).

[0055] Thus, although configuration data can be updated on real time at the display list on the screen in the client process 60 into which it changed actually For the client process which starts reference of the part used as this object for modification, the modification Research and Data Processing Department 81 The information on the location (reflection starting position) of the modification information by which hysteresis is carried out to the modification information storage section 82 made to reflect to the configuration database 90 is held, and whenever the configuration database 90 is updated, it is necessary to move a reflection starting position.

[0056] Next, the actuation made to reflect in other client processes 70 of referring to the part containing the components which had the content of modification made in the client process 60 changed is explained.

[0057] The indicative-data Management Department 73 of the client process 70 is monitoring the content of the modification information storage section 82 continuously, and if the modification information over the part which is carrying out a screen display in the client process 70 is registered into the modification information storage section 82, it will read the modification information concerned. The indicative-data Management Department 73 becomes the same content about the configuration of the components which became the client process 60 which is the creation origin of modification information, and an object for modification by reflecting this modification information. If it explains to a detail, although the client process 70 reads the configuration data about a reference part from the configuration database 90 and they are loading and carrying out a screen display to memory, it should become the same as the content of the memory in the client process 60 to the components used as the object for modification by updating based on modification information to the configuration data on this memory. Thus, the same part shape can be displayed on real time by making the content of modification performed in other client processes reflect.

[0058] By the way, when two or more architects are designing in parallel according to the team format Usually, although it is desirable to monitor the content of the modification information storage section 82 continuously as above-mentioned, and to make the content of modification reflect in real time, it sets to the design method in the gestalt of this operation. The content of modification can be made to reflect

in each client process to the timing of the time of reception of periodical or the broadcast message aiming at taking a synchronization etc., or arbitration. For example, the modification information reflection record table as bundled up to the modification Research and Data Processing Department 81 and shown in drawing 9 is set up for every part. The serial number of the modification information by the place that the content of a design / correction which other client processes performed in each client process was made to reflect on memory is recorded on this table. That is, the location of the modification information read from the modification information storage section 82 in each client process for renewal of a screen display is recorded on the modification information reflection record table. for example, what is necessary will be to carry out reading appearance of all the modification information of the 6th henceforth which is not made to still reflect in a screen display from the modification information storage section 82 if a screen display is changed into the condition of the newest and it excels, since the client process whose ID is 1 according to drawing 9 made the modification information to the 5th reflect and the display on a screen is updated, and just to carry out sequential execution In addition, without carrying out package management of the location (reflection location) of the modification information which each client process read in the modification Research and Data Processing Department 81, even if it makes it make each one of reflection locations manage in each client process, it can realize.

[0059] Thus, the content of modification can be made to reflect on a screen to the timing of arbitration in each client process. And if all client processes always read the newest modification information and you are trying to make it reflected on memory, the display of the newest part shape should be attained in the screen in all client processes. In addition, if it enables it to specify the serial number in each client process by using a modification information reflection record table, it is possible to also make even the modification information on the location of arbitration reflect in a screen display.

[0060] Next, actuation of the client process 60 when the client processes 60 and 70 have acquired the update rights of the same part simultaneously is made into an example, and actuation when two or more architects have acquired update rights is explained.

[0061] The client process 60 will gain a semaphore, if a command is published as mentioned above (steps 41-43). By the way, when the update process is performed by two or more persons (step 44), the modification information which other client processes 70 created should be registered into the modification information storage section 82. Moreover, as shown in drawing 9, each client process can know whether you made it reflected on a screen to which modification information in the part which self has updated. Therefore, by reading altogether the modification information on the part which is not reflected from the modification information storage section 82, and performing it, the client process 60 is made to reflect in the configuration data on memory, and can be changed into the newest condition (step 45). Since the indicative-data Management Department 63 updates an indicative data with renewal of configuration data at this time, a screen display of the newest part shape can be carried out. And the configuration data modification section 61 checks consistency of whether the published command can perform actually (step 46). This is because other architects execute a command and can change to the same components, while the architect did a screen display of the components and having inputted the command, and is because the command performed behind may be unable to perform normally in this case. For example, the case where the command that other architects delete the element of No. 5 is executed etc. corresponds at this during the input of the command which moves the element (components) of No. 5 in the direction of X 10mm. In such a case, the configuration data modification section 61 releases a semaphore, without making the content of modification reflect noting that it detects conflict, without the ability taking consistency (steps 47 and 52). In addition, it means that error status is returned to the architect who inputted the command, and the input command was canceled.

[0062] On the other hand, if consistency can be taken as a result of the check of consistency, as mentioned above, a command will be executed actually, the configuration data on memory, the content of a screen display, and the content of the configuration database 90 will be updated, respectively, and a semaphore will be released (steps 48-52).

[0063] Thus, since the client process 60 was registered into the configuration database 90 after it made

the content of modification by other client processes 70 read not only from the content of modification of self but from the modification information storage section 82 reflect in the configuration data on memory, without overwriting the content of a design / correction by other architects, and disappearing, it can carry out the concurrency of the design to the same components etc., and can perform it. In addition, when a screen display of other parts which have not acquired update rights is carried out, renewal only of the configuration data on memory is only possible, and it cannot be overemphasized that renewal of the configuration database 90 cannot be performed.

[0064] In addition, although only the part changed like the above-mentioned processing whenever it executed the command has updated the configuration database 90, the configuration data modification section 61 When partial renewal of data when the sequential file is being used as a database cannot be performed You may make it rewrite the whole round head by the data more than a memorandum collectively, just before ending a session rather than updating the configuration database 90 at every activation of a command. In addition, it is necessary to move the reflection starting position in the modification information storage section 82 even in this case.

[0065] Moreover, when other architects have already started the team design, each client process can change a screen display into the newest condition by reading and performing modification information from the modification information storage section 82, while reading configuration data from the configuration database 90.

[0066] Moreover, the modification information currently recorded on the modification information storage section 82 can be deleted, after it is reflected in the configuration database 90 and all working client processes make it reflected in memory.

[Translation done.]

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PRIOR ART

[Description of the Prior Art] The CAD system of the so-called team format which divides the appearance of the created automobile into two or more parts (component) used as a design unit, and designs at least each part in parallel simultaneously after that like the design of the former, for example, an automobile, when designing what consists of components which the object for a design is comparatively large-sized, and attain to a large number is introduced. In the CAD system by this team format, since two or more architects can do the concurrency of the design like each part and can advance it in each terminal unit for data processing, it becomes possible to aim at increase in efficiency of a design, and compaction of a design period. However, an architect needs to grasp the newest configuration of the part by the others' design on real time, when designing the part which interferes with others' design parts, such as a part for a connection with an adjoining part, and suits. Then, in the former, when correction is made to the adjoining part as shown, for example in JP,5-242174,A, aggravation of communication between architects is prevented by displaying the content of correction on real time, and the design by the team format efficient as a whole is enabled.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention] This invention divides one object for a design into two or more parts in a CAD system, and relates to the increase in efficiency of a design to the same part by the design method by the team format of designing by carrying out the concurrency only of each part, especially two or more architects.

[Translation done.]

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, even if the above-mentioned design method is able to make real time reflect in the display screen of a self terminal unit the content of correction over other parts performed by carrying out a concurrency, it does not accept modification to the same part made by carrying out a concurrency.

[0004] For example, it is the case where sheathing of the so-called 3 box type which constitutes an engine room, a crew room, and a trunk room empty vehicle object of automobile is designed, and if the case where it designs by dividing a car body into three parts, an engine room, a crew room, and a trunk room, is assumed, an architect will be assigned for every components which usually assign one architect at a time for every part, or are contained at least in each part. Even if it assigns two or more architects the design of one part, he is trying to grant only one architect the update rights of data. In the conventional method, it is because the data saved before that with the data saved to the disk etc. afterwards will be overwritten if it is made to design by assigned and carrying out the concurrency of two or more architects to one part. For example, in the part of an engine room, a concurrency cannot be carried out and a design cannot be performed under the condition that it is the design to the same part in the former, although a side turn signal lamp and front bumpers are components which do not interfere each other mutually.

[0005] Moreover, even if it straddled two or more parts, one architect was usually left as one component (design unit), but if the design of side protection molding, a side mud guard, etc. did not acquire the update rights to all parts simultaneously for the reason mentioned above in the former in order to design this component, it was not able to perform an overall design. Of course, although it is also possible to acquire update rights for every part and to perform a sequential design, it becomes easy to cause the mismatching of the boundary section of a part, and it cannot be said that it is the efficient design approach.

[0006] Thus, even when the components which are two or more design parts were contained to one part used as the object for a design and each part article was shared with two or more architects, each architect assigned to one part in the former was not able to design by carrying out a concurrency.

[0007] It is made in order that this invention may solve the above problems, and the object is to offer the design method and the design approach of a team format in the CAD system which can tell real time about the content of modification to each architect who is referring to the part changed by the design while making possible the thing which receive one part which has two or more design parts and design by carrying out a concurrency.

[Translation done.]